United States Court of Appeals

for the Second Circuit

APPENDIX

Original Copy of Service

75-6115

76-6022

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P/S

IN THE UNITED STATES COURT OF APPEALS
FOR THE SECOND CIRCUIT

Docket Nos.
75-6115
76-6022

THE STATE OF NEW YORK,

Plaintiff-Appellant,

-against-

THE NUCLEAR REGULATORY COMMISSION, et al.,

Defendants-Appellees.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

JOINT APPENDIX
VOLUME I

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UNITED STATES COURT OF APPEALS
FILED
APR 16 1976
A. DANIEL FUSARO, CLERK
SECOND CIRCUIT

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PLAINTIFFS

THE STATE OF NEW YORK

DEFENDANTS

CONNER, J.

THE NEW REGULATORY COMMISSION, AND
WILLIAM ANDERS AS CHAIRMAN:
THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION AND
DR. ROBERT C. SEAMANS AS THE ADMINISTRATOR,
THE DEPARTMENT OF TRANSPORTATION, AND
WILLIAM T. COLEMAN AS SECRETARY OF TRANSPORTATION:
THE DEPARTMENT OF STATE AND
HENRY A. KISSINGER AS SECRETARY OF STATE,
DISM-12/23/75 → THE CIVIL AERONAUTICS BOARD, AND
DIS-12/23/75 ROBERT D. TIMM AS THE CHAIRMAN,
THE FEDERAL AVIATION ADMINISTRATION, AND
ALEXANDER P. BUTTERFIELD AS THE CHAIRMAN,
DISM-12-23-75 → THE UNITED STATES CUSTOM SERVICE, AND
DISM-12/23/75 → VERNON B. ACREE AS COMMISSIONER AND
DISM CAUSE 12/23/75 → FRED R. BOYETT AS REGIONAL COMMISSIONER.

ACTION UNDER NATIONAL ENVIRONMENTAL POLICY ACT OF 1969.

ATTORNEYS

ATTORNEY GENERAL OF THE STATE OF NEW YORK
TWO WORLD TRADE PLAZA,
NEW YORK, N.Y. 10047
488-7562

U.S. ATTORNEY (X-1977)
for defts. Nuclear Regulatory Commission and William Anders as Chairman, "ERDA", and Dr. Robert C. Seamans as Administrator Dept. of Transportation and William T. Coleman as Sec'y of Transportation, Dept. of State and Henry A. Kissinger as Sec'y, Federal Aviation Administration and James E. Dow as Acting Administrator

1

CHECK HERE IF CASE WAS FILED IN FORMA PAUPERIS	FILING FEES PAID DATE	RECEIPT NUMBER	C.D. NUMBER	STATISTICAL CARDS CARD	DATE MAILED
	DEC 5 1975	5117		JS-5	X
				JS-6	

DATE	NR.	PROCEEDINGS
5-05-75	1	Filed Complaint, Issued Summons.
5-05-75	2	Filed Order appointing Peter N. Skinner, Walter Morris and Merrill Kraines, to serve the summons and complaint in the above entitled action. Clerk.
05-12-75	3	Filed summons and return- served the following:
		Nuclear Regulatery Commission c/o Raymond Zimmitt by cert. mail # 162444 on 05-06-75 U.S. Atty. by Ralph Lee on 05-06-75
		Atty. General by Reg. mail # 162445 on 05-06-75
		Vernon B. Acree by cert. mail # 162443, on 05-06-75
		William T. Coleman as Sec'y of Transpertation by cert. mail # 162436 on 05-06-75
		Henry A. Kissinger, Sec'y of State by cert. mail # 162437 on 05-06-75
		Dept. of State, Office of Legal Advisor by cert. mail # 162438 on 05-06-75
		William Anders by cert. mail # 162442 on 05-06-75
		Department of Transpertation- General Counsel by cert. mail # 162439 on 05-06-75
		Energy Research & Development Admin.- by cert. mail # 162441 on 05-06-75
		Civil Aeronautics Board by cert. mail # 162435 on 05-06-75
		Alexander P. Butterfield by cert. mail # 162433 on 05-06-75
		Dr. Robert C. Seamans by cert. mail # 162440 on 05-06-75
		Robert D. Timm by cert. mail # 162434 on 05-06-75
		U.S. Customs Service by cert. mail # 162432 on 05-06-75
		of
-29-	4	Filed affdvt. of service by an individual/summons, complaint for declaratory and injunctive relief, verification, etc. and other papers indicated- served the following:
		Melvin M. Greenberg, Regional Counsel of Customs on 05-05-75
		Attorney for Fred R. Boyatt, Reginal Commissioner of U.S. Custom Services on 05-05-75
5-29-75	5	Filed affdvt. of service by an individual of summons, complaint for declaratory and injunctive relief, verification, etc. and other papers as indicated- served the followingr
		Morton White, Counsel for Federal Aviation Agency on 05-05-75
		Attorney for Federal Aviation Agency on 05-05-75
6-2-75	6	Filed Affidavit of (Aus C.F. Richter)in opposition to pltffs motion for a preliminary injunction etc, as indicated.
6-09-75	7	Filed defts' memorandum of law in opposition to pltff's motion for a preliminary injunction.
25-75	8	Filed pltff's memorandum of law in support of motion for preliminary injunction.
31/75		Filed transcript of record of proceedings, dated May 7, 1975.
-05-75	10	Filed One (1) Large Manila envelope- sealed by order of STEWART, J.
8-06-75	11	Filed ANSWER of defts. "NRC" and William Anders as Chairman "ERDA" and Dr. Robert C. Seamans as Administrator, Dept. of Transpertation and William T. Coleman as Sec'y of Transpertation, Dept. of State and Henry A. Kissinger as Sec'y, Federal Aviation Administration and James E. Dow as acting Administrator to the complaint.

DATE	PROCEEDINGS
08-06-75	(12) Filed one (1) large manila envelope sealed. So ordered- KNAPP. J.
08-15-75	(13) Filed defts. the U.S. Civil Service Commission and the U.S. Customs Service notice of motion for an order pursuant to FRCP Rule 12 (b) dismissing the complaint with respect to said defts. Ret. -8-28-75.
08-15-75	(14) Filed memorandum of law in support of defts' motion to dismiss complaint with respect to the Civil Aeronautics Board and the U.S. Customs Service.
09-03-75	(15) Filed stip & order that the return date of defts. Civil Aeronautics Board and United States Customs Service motion to dismiss the complaint with respect to them is adjourned to 09-05-75. So ordered- CONNER, J.
09-08-75	(16) Filed Affdvt. of John F. Shea in opposition to the motion of the Civil Aeronautics Board and the Unites States Custom Service to dismiss the complaint.
09-08-75	(17) Filed Pltff's memorandum of law in opposition to motion of Civil Aeronautics Board and United States Customs Service to dismiss the Complaint.
09-09-75	(18) Filed memorandum and order #43044 This action under the National Environmental Policy Act charges defts with having violated 42 U.S.C. 4321***presently before the Court is a motion pursuant to Rule 65 for a preliminary injunction retraining defts from transporting SNM from to and over the U.S. and its territories, pending the determination of this action ***The motion for a preliminary injunction is denied.....Conner, J. m/n
9-18-75	Filed transcript of record of proceedings, dated July 31, 1975
9-22-75	Filed transcript of record of proceedings, dated July 25, 1975
9-22-75	Filed transcript of record of proceedings, dated July 20, 1975
10-24-75	Filed Pltff's Affidavits and Order to Show Cause and Temporary Restraining order etc. Ret: 05-22-75 10AM Rm.2703
10-24-75	Filed Pltff's Affidavit correcting certain arithmetical error etc. & in support of Pltff's motion. by John W. Gofman.
10-24-75	Filed Pltff's Affidavit in support of motion for preliminary injunction. by John F. Shea, III
10-24-75	Filed Deft U.S. Nuclear Regulatory Commission's Affidavit in opposition to Pltff's motion for a preliminary injunction.
11-07-75	Filed pltff's notice of appeal to USCA from order entered on 09-09-75 which denies in all respects pltff's motion for preliminary injunctive relief. Copy to: U.S. Atty. for S.D. of N.Y. ent. 11-10-75
Dec. 12-75	Filed pltff's affdvts. and notice of motion for an order for preliminary injunction and for summary judgment. Ret. 12-24-75.
Dec. 12-75	Filed pltff's memorandum of law in support of motion for preliminary injunction and motion for summary judgment.
Dec. 12-75	Filed pltff's Statement pursuant to Rule 9(g) of General Rules.
Dec. 12-75	Filed affdvt. of Theodore T. Mason and Robert R. Leamer in support of pltff's motion for a preliminary injunction and motion for summary judgment.
Dec. 12-75	Filed affdvt. of Capt. James A. Eckels in support of the State of N.Y.'s motion for a preliminary injunction and motion for summary judgment.
12-12-75	Filed Order extending time to transmit record to Appellate Court to 02-05-75. CONNER, J (m-n)
12-23-75	Filed Filed Memorandum-Decision and Order- Opinion # 43591--for the reasons set forth, defts' the Civil Aeronautics Board and the United States Customs Service motion to dismiss those portions of the complaint that are directed against them is granted . So ordered- CONNER, J. (m/n)
1-12-76	Filed defts' memorandum of law in opposition to pltff's motion of 12-12-75 for a preliminary injunction and for partial summary judgment.

(CONT'D — PG. # 4 — OTHER SIDE)

DATE	PROCEEDINGS	Date Ord Judgment
01-23-76	Filed pltff's memorandum of law in further suppert of motion for preliminary injunction and motion for summary judgment.	
01-23-76	Filed pltff's affdvt. of Theodore T. Mason and Robert R. Leamer in further support of pltff's motions.	
01-23-76	Filed pltff's affdvt. of John F. Shea, III, in further suppert of pltff's motions for a preliminary injunction and summary judgment.	
02-05-76	Filed defts' affdvt. of Jack Adlow in opposition to N.Y. State's motion for a preliminary injunction.	
02-05-76	Filed stipulation between parties on contents of the record re: affdvts. of service of the summons and complaint, etc., upon Fred R. Boyett as Regional Commissioner of the U.S. Customs Service on 5-5-75 and upon the Federal Aviation Administration on 5-5-75	
02-05-76	Filed pltff's notice of appeal to the USCA from the order entered on 12-23-75 which order dismissed the complaint as to defts. Civil Aeronautics Board and the U.S. Customs Service. Copy mailed to: U.S. Atty. for SDNY . Ent. 02-06-76	
02-11-76	Filed stip & order for retention of record of pltff's motion for preliminary injunctive relief by District Court Clerk pursuant to Rule 11(c) FRAP. So ordered- CONNER, J.	
02-13-76	Filed stipulation between the parties for retention of record by District Court Clerk pursuant to Rule 11(c) FRAP	

SUMMONS IN A CIVIL ACTION (Formerly D. C. Form No. 41 Rev.) CIV.

United States District Court

FOR THE

SOUTHERN DISTRICT OF NEW YORK

JUDGE CONNER

CIVIL ACTION FILE NO. 75 Civ 2121 (WCC

THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and VERNON B. ACREE as Commissioner and FRED R. BOYETT as Regional Commissioner,

Defendants.

SUMMONS

To the above named Defendants:

You are hereby summoned and required to serve upon LOUIS J. LEFKOWITZ, Attorney General of the State of New York

plaintiff's attorney, whose address Department of Law
Environmental Protection Bureau
Two World Trade Center
New York, New York 10047

JOHN F. SHEA, III, ESQ.
JOSEPH J. ZEDROSSER, ESQ.
of Counsel

an answer to the complaint which is herewith served upon you, within 60 days after service of this summons upon you, exclusive of the day of service. If you fail to do so, judgment by default will be taken against you for the relief demanded in the complaint.

/ RAYMOND F. BURGHARDT
Clerk of Court.

s/ E. A. BECKER
Deputy Clerk.

Date: MAY 5, 1975

[Seal of Court]

NOTE:—This summons is issued pursuant to Rule 4 of the Federal Rules of Civil Procedure.

5

RETURN ON SERVICE OF WRIT

I hereby certify and return, that on the day of 19

I received this summons and served it together with the complaint herein as follows:

MARSHAL'S FEES

Travel ---- $ ----------

Service ---- ----------

United States Marshal.

By ----------

Deputy United States Marshal.

Subscribed and sworn to before me, a this

day of , 19 .

[SEAL]

Note:—Affidavit required only if service is made by a person other than a United States Marshal or his Deputy.

No. ----------

United States District Court
FOR THE
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,

Plaintiff,

v.

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; et al.,

Defendants.

SUMMONS IN CIVIL ACTION

Returnable not later than 60 days after service.

LOUIS J. LEFKOWITZ
Attorney General of the
State of New York
Attorney for Plaintiff

Attorney for Plaintiff

6

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

----------X

THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and VERNON B. ACREE as Commissioner and FRED R. BOYETT as Regional Commissioner,

Defendants.

75 Civ

COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF

----------X

Plaintiff, the State of New York, by its attorney, Louis J. Lefkowitz, Attorney General of the State of New York, for its complaint herein against defendants, alleges:

INTRODUCTION

1. This action seeks a judgment declaring that defendants' actions in licensing, approving, allowing, or executing, directly or indirectly, the transportation by air and related connecting transport of plutonium and other special nuclear materials without having completed and filed a full Environmental Impact Statement with the Council on Environmental Quality (hereinafter "CEQ") concerning such transport of plutonium and other special nuclear materials to, from, in, or over the City and State of New York and the United States and its territories are in violation of the National Environmental Policy Act of 1969 [42 U.S.C. § 4321 et seq.] (hereinafter "NEPA") and

1

the CEQ Guidelines. This action further seeks a judgment permanently enjoining, annulling and setting aside all present and future licenses, approvals and other actions of defendants, their agents, servants and employees and all persons in active concert and participation with them which, directly or indirectly, permit or execute the transport by air and related connecting transport of plutonium and other special nuclear materials to, from, in, and over the City and State of New York and the United States and its territories.

JURISDICTION AND VENUE

2. This Court has jurisdiction pursuant to:

28 U.S.C. § 1331 (Federal Question)
28 U.S.C. § 1361 (Mandamus)
28 U.S.C. § 1651 (All Writs)
28 U.S.C. §§ 2201-02 (Declaratory Judgment)
5 U.S.C. §§ 701-06 (Administrative Procedure Act)
42 U.S.C. § 4321 et seq. (NEPA)

Venue is based upon:

28 U.S.C. §§ 1391

3. With respect to the plaintiff, the amount in controversy exceeds ten thousand dollars, exclusive of interest and costs.

4. There exists between the parties an actual controversy, justiciable in nature, with respect to which the plaintiff requires a declaration of its rights by this Court.

THE PARTIES

5. Plaintiff, the State of New York, is a body politic and a sovereign entity, resides in and has offices in the Southern District of New York and brings this action on behalf of itself and as parens patriae on behalf of all residents and citizens of the State of New York. The State, its residents and citizens stand to suffer irreparable harm from the transportation by air

and the related connecting transport of plutonium and other special nuclear materials to, from, in, and over the State of New York, and they have no adequate remedy at law.

6. Defendant William Anders is Chairman of defendant Nuclear Regulatory Commission (hereinafter "NRC") which is an independent regulatory commission established by Act of Congress (42 U.S.C. § 5841). The Chairman is entrusted with the faithful execution of the policies and decisions of the Commission, which is charged with all the licensing and related regulatory functions of the former Atomic Energy Commission (42 U.S.C. § 5841[f]).

7. Defendant Energy Research and Development Administration (hereinafter "ERDA") is an independent executive agency established by Act of Congress 42 U.S.C. § 5811 and headed by defendant Dr. Robert C. Seamans as Administrator (42 U.S.C. § 5812). The Administrator, pursuant to 42 U.S.C. § 5813, is charged with, in part, responsibility for encouraging and conducting research and development related to the development and use of energy from nuclear energy sources as well as encouraging and participating in international cooperation on energy and related environmental research and development. ERDA is to carry out the performance of the production activities and general basic research activities of the former Atomic Energy Commission (42 U.S.C. § 5801). ERDA's Office of International Affairs acts in cooperation with the State Department in arranging and approving certain imports and exports of special nuclear materials. On its own ERDA transports domestically special nuclear materials utilized in its research and development programs, much of that transport being done by air.

8. Defendant William T. Coleman is the Secretary of Transportation and is head of the defendant, Department of Transportation (hereinafter "DOT"), an executive department of the federal government, and as such he is charged with leadership

in the development of national transportation policies and the development of technological and other information relevant to domestic and international transportation modes (49 U.S.C. §§ 1652 and 1653). The DOT promulgates those regulations regarding the casking and containment of special nuclear materials for international and domestic transport.

9. Defendant Dr. Henry A. Kissinger is Secretary of State and is charged with the administration of the Department of State (hereinafter "State Department"), also defendant herein, which is an executive department of the federal government (22 U.S.C. §§ 2651 and 2653). The Department of State has created within itself the Office of Nuclear and Energy Technology Affairs to assist in negotiations with foreign states in the area of energy development abroad. Periodically Dr. Kissinger and the State Department enter into international agreements of cooperation approving a policy of exchange of nuclear materials and technology abroad involving the import and export of special nuclear materials for use other than for purposes of national defense or weapons development. Such imports and exports are purely for commercial and research and development uses.

10. Defendant Robert D. Timm is the Chairman of the defendant, Civil Aeronautics Board (hereinafter "CAB"), and is charged with the regulation of air transportation in a manner which will ensure the highest degree of safety in air transportation and is further charged with the promotion of safety in air commerce (49 U.S.C. §§ 1302, 1303, and 1321).

11. Defendant Alexander P. Butterfield is Chairman of defendant Federal Aviation Administration (hereinafter "FAA") and is charged with the planning and control of the use of navigable airspace and the regulation of practices and procedures governing the design materials and construction of aircraft as is deemed

necessary to protect persons and property aboard aircraft in air transportation against acts of criminal violence and aircraft piracy (49 U.S.C. §§ 1341, 1344 and 1357).

12. Defendants Vernon B. Acree and Fred R. Boyett are the Commissioner of Customs and the Regional Commissioner of Customs for the Region encompassing the Port of New York, respectively, of the defendant United States Customs Service (hereinafter "Customs"). Defendants Acree and Boyett are charged with the enforcement of customs law and regulations of the United States and with the prevention of the unlawful entry of persons and property at the borders of the United States and the Port of New York specifically (19 U.S.C. § 1 et seq.).

THE FACTS

13. Upon information and belief, presently the NRC issues licenses for the import, export and domestic transport of "special nuclear materials" which by regulatory definition include plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the NRC may determine to be special nuclear material. Such licenses do not in any way restrict the mode of transport to any particular form. It has been stated by NRC officials that they do not concern themselves as to whether shipments are made by land, sea, or air.

14. Upon information and belief details of shipment are left up to the parties involved, who must procure the services of a nuclear materials shipper if they themselves are not equipped to handle such shipments. The shipper handling imports and exports of special nuclear materials must obtain the appropriate import and export licenses from the NRC pursuant to 10 CFR Part 70. Parties wishing to ship such materials strictly domestically must obtain NRC licenses which, in addition to other activities, allow licensees to conduct such domestic shipments, again without restriction as to the ultimate choice of shipping mode -- land, sea or air.

//

15. Upon information and belief the licenses covering imports and exports are granted by the NRC on a shipment by shipment basis. A license, while it covers only one shipment, may approve a number of individual transport loads. For example, one import license covering plutonium dioxide (PuO_2) being imported for fabrication into fuel elements prior to export may cover six or seven planeloads of the special nuclear material. Copies of three import licenses are attached to the complaint as Exhibits "A", "B" and "C".

16. Upon information and belief the State Department sometimes enters into international agreements of cooperation which approve of a policy of nuclear materials transfers between the United States and foreign countries or authorities. The Secretary of State oversees the activities of the office of Nuclear and Energy Technology Affairs, which assists in the negotiations of such agreements.

17. Upon information and belief ERDA's Office of International Affairs does not participate directly in the drafting of such international agreements; however, it does assure that exports of special nuclear materials are in accord with international agreements of cooperation.

18. The Department of Transportation has established requirements for the containment of these materials during air transport (See 49 CFR Parts 170-189, 14 CFR Part 103, and 46 CFR Part 146). These regulations are applicable to imports as well as exports and upon information and belief the DOT has specifically approved certain containment designs or containment design regulations of some foreign countries (a copy of a "certificate of competent authority" issued by the office of the Secretary of Transportation is annexed hereto as Exhibit "D"). It is within the power of the DOT to reject the shipment of materials when containment vessels are found to be inadequate.

19. The CAB is charged with the regulation of air-shipping, and the promotion of safety and security in air transport. The carriage of special nuclear materials and all other property in air transport is subject to CAB flight clearances and flight routing.

20. Upon information and belief FAA specifically regulates the packaging, marking and labelling of all hazardous material including nuclear materials in any civil aircraft in the United States. In regulating packaging FAA has adopted DOT's regulations referred to in paragraph 18 above.

21. Upon information and belief the Customs Service clears each import of special nuclear materials upon arrival in the United States. Quantities and packaging of materials are checked prior to final clearance.

22. Upon information and belief in addition to those air shipments of special nuclear materials by commercial carriers and shippers which are covered by NRC import, export or domestic transport licenses, ERDA makes its own shipments of special nuclear materials utilizing all forms of transportation including aircraft. It does so without any licensing procedures whatsoever other than internal approval procedures; moreover, no reporting mechanisms exist for such shipments by ERDA, whereby other Federal or local authorities would be notified of such shipments.

23. Upon information and belief on July 29, 1974, a total of 500,000 curies of PuO_2 (Plutonium dioxide, powder form) was imported through JFK by Transnuclear Corp., a special nuclear materials shipper, under NRC license. Details concerning prior 1974 shipments are contained in Exhibit "E".

24. Upon information and belief, on or about September 27, 1974, a total of 455,539 curies of Pu(NO3)4 (plutonium nitrate, liquid) was exported through JFK aboard Seaboard World Airlines under NRC license.

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25. Upon information and belief, on October 19, 1974, a total of 453,610 curies of $Pu(NO3)_4$ was exported through JFK aboard Seaboard World Airlines under NRC license.

26. Upon information and belief, as recently as February 24, 1975, 500,000 curies of PuO_2 was imported through JFK aboard Seaboard World Airlines under NRC license.

27. Plaintiff was not a party to any licensing or other actions of defendants relating to any present or future shipments of plutonium or other special nuclear material and had no prior knowledge of such licensing or other actions of defendants.

28. On March 28, 1975 and March 31, 1975, the Attorney General of the State of New York made demands of defendants State Department, NRC, DOT, FAA and CAB as to whether they had filed an Environmental Impact Statement pursuant to NEPA assessing the impact of the respective agency's actions regarding the transportation by air and related connecting transport of special nuclear material and whether they had conducted hearings or otherwise solicited comment from other governmental agencies regarding such transportation. Copies of these demands are attached as Exhibits "F", "G", "H", "I" and "J". On April 4, 1975, the Governor of New York State and the State Commissioner of Environmental Conservation asked defendant William Anders to suspend all licenses for the air transport of plutonium through JFK (see Exhibit "K").

29. Responses to the demand of the Attorney General were received from State Department, CAB, FAA, DOT and NRC (copies of the letters are attached hereto as Exhibits "L", "M", "N", "O", "P", and "Q".

30. Upon information and belief, the NRC has stated that licenses already issued by it for imports and exports of such material and all licenses covering domestic shipments of such materials are valid and to be upheld and that shipments of plutonium and other materials will in fact be made pursuant to such licenses and that the NRC is still processing applications for additional import and export licenses.

31. Upon information and belief there has been no Environmental Impact Statement filed by any of the defendants in accordance with the requirements of NEPA assessing the impacts of air transport and related connecting transport of plutonium and special nuclear materials to, from, in, and over the City and State of New Y or to, from, in, and over the United States and its territories, and no draft statement has been circulated by any of defendants for comment by plaintiff.

32. Upon information and belief there are in effect a number of NRC licenses which permit the import and export by air of plutonium and other special materials through New York State and the United States. In addition there are approximately 30 NRC licenses issued which permit the domestic shipment by air of such materials through these areas.

33. Upon information and belief, in the immediate future a shipment of plutonium will be received at a New York State airport. For security purposes, details will be supplied in a separate affidavit which plaintiff will request to be sealed.

34. Upon information and belief, ERDA and commercial domestic air shipments of special nuclear materials including plutonium will be brought through New York State in the immediate future.

35. Air shipment of special nuclear materials endangers the lives of New York citizens primarily in two ways:

a) The possibility of an aircraft accident resulting in a release of special nuclear materials or radiation therefrom, and

b) the possibility of terrorist activities directed toward such materials in the course of air transport or related connecting transport resulting in

i deliberate dispersal of materials or radioactivity,

ii manufacture of nuclear weapons, or

iii accidental release of materials or radioactivity.

36. Plutonium, especially in the form of plutonium dioxide (PuO_2), is one of the most deadly substances in existence, having high toxicity with an extraordinarily long half-life. A dispersal of only 2 3/4 pounds of PuO_2 as a result of an aircraft accident could result in the death of over a hundred thousand New Yorkers under possible meteorological conditions. Effective dispersal by terrorists could result in untold deaths. Moreover, both plutonium and U-235, another special nuclear material, are suitable for manufacture into nuclear weapons.

37. A Special Safeguards Study prepared for the NRC has concluded that with respect to safeguards regulations new

> "factors make necessary a new and fundamental look at the problem. The first of these is widespread and increasing dissemination of precise and accurate instructions on how to make a nuclear weapon in your basement . . . such information may have always been available in the classified literature. . . The psychological effect on terrorist groups of widespread dissemination of such information should not be overlooked . . ." (See Exhibit "R")

That report recognized that terrorist groups have the ability to infiltrate highly trained teams of 10 to 15 men into this country without detection. Such groups, the report notes, have shown the ability of urban terrorists to operate with near impunity for long periods of time. The report further states:

> "These groups are likely to have available to them the sort of technical knowledge needed to use the now widely disseminated instructions for processing fissile materials and for building a nuclear weapon. They are also liable to be able to carry out reasonably sophisticated attacks on installations and transportation." See Exhibit "R", p. 3. (Emphasis supplied)

38. Upon information and belief, for the July 29, 1974 shipment of imported plutonium at least 124 persons, many not on the executive level, in eleven public and private agencies knew details of the shipment prior to its arrival at JFK.

39. While numerous individuals of questionable importance knew of certain plutonium flights, the February 24, 1975 shipment of 500,000 curies of PuO_2 went through JFK completely without notice to officials of the Port Authority of New York who operate JFK and are responsible for security thereat. An identical incident occurred with a shipment in December 1974 (see Exhibit "S").

40. Upon information and belief security systems for which defendants are responsible have failed to insure that complete protection is accorded shipments of plutonium and other special nuclear materials.

THE LAW

41. The National Environmental Policy Act of 1969 declares that:

[§ 4331(b)] In order to carry out the policy set forth in this chapter, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may-

. . .

(2) assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences . . . .

[§ 4332] The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall-

(B) identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations;

(C) include in . . . major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on-

(i) the environmental impact of the proposed action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the proposed action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

> . . . Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to . . . the public as provided by Section 552 of Title 5, and shall accompany the proposal through the existing agency review processes . . .". [underlining added]

42. The Council on Environmental Quality ("CEQ"), which was created pursuant to NEPA, has issued Guidelines on the preparation of impact statements, "Statements on Proposed Federal Actions Affecting the Environment". 40 C.F.R. § 1500 et seq. (1973). These Guidelines provide that the environmental assessment should come "as early as possible and in all cases prior to agency decision concerning major action or recommendation." Further, the CEQ Guidelines state that an impact statement is to be prepared even where federal actions are "localized in impact, . . . if there is potential that the environment may be significantly affected" as the result of the "overall, cumulative impact of the action proposed (and of further actions contemplated)." Moreover, "[P]roposed actions, the environmental impact of which is likely to be highly controversial, should be covered in all cases."

43. The transport by air and related connecting transport of plutonium and the special nuclear materials to, from, and in, over the State of New York and the United States and its territories involves major federal action in the following respects:

a) federal approval and licensing of international nuclear materials shipment;

b) federal approval and licensing of domestic shippers of such materials;

c) federal approval of nuclear materials shipping containers;

d) federal responsibility to review the security systems and procedures for shipments of such materials;

e) federal control of airways and airspace;

f) federal responsibility for the promotion of safety in air commerce and the protection of persons and property aboard aircraft against acts of criminal violence and aircraft piracy;

g) federal inspections with respect to all of the above;

h) actual air shipment by federal government of such nuclear materials;

44. The air transport and related connecting transport of plutonium and other special nuclear materials has the potential of significantly affecting the quality of the human environment.

45. In failing to file an Environmental Impact Statement in accordance with the requirements of NEPA assessing the impacts of air transport and related connecting transport of plutonium and special nuclear materials to, from, in and over the City and State of New York and to, from, in and over the United States and its territories, prior to the licensing and other actions of defendants, defendants have violated a clear, non-discretionary legal duty.

RELIEF SOUGHT

WHEREFORE, plaintiff prays for judgment:

a¶ declaring that defendants' action in licensing, approving, allowing, and executing, directly or indirectly, the transportation by air and related connecting transport of plutonium and other special nuclear materials without having completed and filed a full Environmental Impact Statement concerning such

transport of plutonium and other special nuclear materials to, from, in, or over the City and State of New York and the United States and its territories are in violation of NEPA and the CEQ guidelines;

b) permanently enjoining, annulling and setting aside all present and future licenses, approvals and other actions of defendants, their agents, servants, employees, attorneys and all persons in active concert and participation with them which, directly or indirectly, permit or execute the transport by air and related connecting transport of plutonium and other special nuclear materials to, from, in, and over the City and State of New York and the United States and its territories; and

c) granting plaintiff's costs and disbursements;

d) granting such other and further relief to the plaintiff as the Court may consider just and proper.

Dated: New York, New York
May 5, 1975

LOUIS J. LEFKOWITZ
Attorney General of the
State of New York
Attorney for Plaintiff
Office & P.O. Address
2 World Trade Center
New York, New York 10047
Tel. No. (212) 488-7562
By

JOHN F. SHEA, III
Assistant Attorney General

VERIFICATION

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

JOHN F. SHEA, III, being duly sworn, deposes and says that he is an Assistant Attorney General in the Department of Law of the State of New York on the staff of the Bureau of the Environmental Protection; that he is fully familiar with the facts herein; that he has read the foregoing complaint and knows the contents thereof; that the same is true of his own knowledge, except as to the matters therein stated to be alleged on information and belief and that as to those matters he believes it to be true; and that the reason he makes this verification instead of the plaintiff is that the plaintiff is a state.

JOHN F. SHEA, III

Sworn to before me this
5th day of May, 1975

Assistant Attorney General
of the State of New York

Public Document Room

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 15 1974

APR 22 1974

L:FFRB:WTC
70-1613
SNM-1468

Transnuclear, Inc.
ATTN: Ms. Beverly Back
5205 Leesburg Pike
Falls Church, Virginia 22041

Gentlemen:

Enclosed is Special Nuclear Material Import License No. SNM-1468 requested in your application dated March 20, 1974.

Sincerely,

Robert J. Davis

for L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch
Directorate of Licensing

Enclosure:
As stated

"A" 23

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

COPY

License No.: SNM-1468

Docket No.: 70-1618

Date Issued: APR 15 1974

SPECIAL NUCLEAR MATERIAL IMPORT LICENSE

Pursuant to Title 10, Code of Federal Regulations, Part 70, a license is hereby issued to Transnuclear, Inc., 5205 Leesburg Pike, Falls Church, Virginia, authorizing the company to import from Belgium 140 kilograms of plutonium as plutonium oxide.

This license is issued in accordance with the application dated March 20, 1974, and will expire November 30, 1975.

This license is subject to the following conditions:

1. The licensee shall obtain all information from the foreign exporter necessary to complete the shipper's portion of Form AEC-741, "Nuclear Material Transfer Report." If the licensee is the receiver of the material, he shall record this shipper's information on the copy of the Form AEC-741 completed and sent to AEC pursuant to Section 70.54 of 10 CFR Part 70. If the licensee is not the receiver of the material, he shall provide the shipper's information to the receiver of the material for inclusion on the receiver's Form AEC-741.

2. The licensee shall notify the Materials and Plant Protection Operations Branch, Directorate of Regulatory Operations, immediately, by telephone or telegram, if entry of any import shipment authorized by this license is refused by the U. S. Bureau of Customs.

3. Each time material is imported, the licensee shall show the original of the license to U. S. Customs as authority for the import. The original of the license showing the imported quantity shall be surrendered to U. S. Customs when the final transaction under the license is completed. Except for the final transaction, a copy of the license showing the imported quantity shall be surrendered to U. S. Customs for each shipment. All surrendered documents shall be marked for immediate transmittal to the Directorate of Regulatory Operations, Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406.

COPY

4. For import shipment of 350 grams or more of U-233, plutonium, and/or U-235 contained in uranium enriched in the U-235 isotope 20% or above, and for import shipments of 5 kilograms or more of U-235 contained in uranium enriched in the U-235 isotope below 20%, the licensee shall promptly notify the Directorate of Regulatory Operations, Region I by telephone, telegram or teletype, upon receiving notification that an import shipment has entered the country, giving the date that the import entered and the estimated time of arrival at the stated destination.

5. The licensee shall assure that any shipment of plutonium, U-233, or U-235 contained in uranium enriched to 20% or more in the U-235 isotope shall be protected in transit after it arrives in this country in accordance with the provisions of 10 CFR Part 73.

FOR THE ATOMIC ENERGY COMMISSION

R. J. Dube

L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch
Directorate of Licensing

70-1618

TRANSNUCLEAR, INC.





March 20, 1974

Mr. Crow
Fuel Fabrication and Reprocessing
Directorate of Licensing
4530 East West Highway
East West Tower Building
Bethesda, Maryland 20014

Dear Mr. Crow:

Please consider this letter an application for import license in accordance with 10 CFR 70.22 (c).

1). Applicant: TRANSNUCLEAR, INC.
5205 Leesburg Pile
Falls Church, Virginia 22041

2). Ultimate Consignee: Westinghouse Electric Corporation
Nuclear Fuel Division
Plutonium Fuel Development Lab.
Cheswick Avenue
Building 8, Gate D
Cheswick, Pennsylvania 15024



3). Intermediate Consignee:
TRANSNUCLEAR, INC.
5205 Leesburg Pike
Falls Church, Virginia 22041

4). This material is recovered plutonium from the Trino Reactor in Italy. The plutonium was reprocessed by Eurochemic in Mol, Belgium.

5). Material is privately owned and will be shipped from Eurochemic, Mol, Belgium to Westinghouse, Cheswick, Pennsylvania loaded in LID-1 containers according to I.A.E.A. Certificate Number USA/4960/BF (copy enclosed). The Belgian validation of the I.A.E.A. Certificate will be submitted to the U.S. Department of Transportation prior to import of material.

0663

SKYLINE CENTER • 5205 LEESBURG PIKE • FALLS CHURCH VIRGINIA 22041
TELEPHONE: 703-820-2450 • CABLE: TRANSNUCL FSCH • TELEX: 89-9462

26

TRANSNUCLEAR, INC.

6). The total quantity of material to be imported is 140 kilograms plutonium. The first shipment is planned to arrive in May, 1974 and the last shipment in 1975. Therefore, please issue this license for a period of 18 months.

7). Material will be imported and delivered to Westinghouse under our approved security plan.

If there are any questions, please contact this office.

Very truly yours,

Beverly Back
Traffic Coordinator

Enslosure: as stated

BB/vm

Mike Roger

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

COPY

License No.: SNM-1468

Docket No.: 70-1618

Date Issued: APR 15 1974

SPECIAL NUCLEAR MATERIAL IMPORT LICENSE

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This license is issued in accordance with the application dated March 20, 1974, and will expire November 30, 1975.

This license is subject to the following conditions:

1. The licensee shall obtain all information from the foreign exporter necessary to complete the shipper's portion of Form AEC-741, "Nuclear Material Transfer Report." If the licensee is the receiver of the material, he shall record this shipper's information on the copy of the Form AEC-741 completed and sent to AEC pursuant to Section 70.54 of 10 CFR Part 70. If the licensee is not the receiver of the material, he shall provide the shipper's information to the receiver of the material for inclusion on the receiver's Form AEC-741.

2. The licensee shall notify the Materials and Plant Protection Operations Branch, Directorate of Regulatory Operations, immediately, by telephone or telegram, if entry of any import shipment authorized by this license is refused by the U. S. Bureau of Customs.

3. Each time material is imported, the licensee shall show the original of the license to U. S. Customs as authority for the import. The original of the license showing the imported quantity shall be surrendered to U. S. Customs when the final transaction under the license is completed. Except for the final transaction, a copy of the license showing the imported quantity shall be surrendered to U. S. Customs for each shipment. All surrendered documents shall be marked for immediate transmittal to the Directorate of Regulatory Operations, Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406.

COPY

28

4. For import shipment of 350 grams or more of U-233, plutonium, and/or U-235 contained in uranium enriched in the U-235 isotope 20% or above, and for import shipments of 5 kilograms or more of U-235 contained in uranium enriched in the U-235 isotope below 20%, the licensee shall promptly notify the Directorate of Regulatory Operations, Region I by telephone, telegram or teletype, upon receiving notification that an import shipment has entered the country, giving the date that the import entered and the estimated time of arrival at the stated destination.

5. The licensee shall assure that any shipment of plutonium, U-233, or U-235 contained in uranium enriched to 20% or more in the U-235 isotope shall be protected in transit after it arrives in this country in accordance with the provisions of 10 CFR Part 73.

FOR THE ATOMIC ENERGY COMMISSION

R.J. Dube

L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch
Directorate of Licensing

29

AEC-314
(1-74)

RECEIVED

UNITED STATES ATOMIC ENERGY COMMISSION

70-1796

CERTIFICATE OF DISPOSITION OF MATERIALS
(ALL BLOCKS MUST BE COMPLETED)

1975 JAN 17 AM 8 32

OFFICE OF THE SECRETARY
D.C.

PUBLIC
DOCUMENT ROOM

LICENSEE NAME AND ADDRESS:

Edlow International Co. as agents for
Australian Atomic Energy Authority
1100 17th St. N.W. #404
Washington, D.C.20036

LICENSE NUMBER:
SNM 1501

LICENSE EXPIRATION DATE:
02/28/75

The licensee and any individual executing this certificate on behalf of the licensee certify that (check appropriate item(s) below)

A.___ No materials have been procured by licensee.

B. x All materials procured and/or possessed by licensee under license number shown above, have been:

Transferred to: USAEC/ c/o Atlantic Richfield
Richland Washington,

which has license number: exempt

C. √ Disposed of in compliance with 10 CFR 20.

D.___ Licensed under license number _____ issued by:

_____, an Agreement State pursuant to Section 274 of the Atomic Energy Act of 1954, as amended.

REMARKS: (if additional space is needed, use reverse side)

RECEIVED
JAN 13 1975
REGULATORY
MAIL SECTION
DOCKET CLERK

RECEIVED
JAN 17 1975

Drew Dickert
Signature of Certifying Official

Jan 6 1975
Date

Please return to:
U.S. Atomic Energy Commission
Office of Regulation
Directorate of Licensing
Washington D.C. 20545

"B"

30

1

PDR

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NOV 19 1974

L:FFR3:WTC
70-1796
SNM-1501

RECEIVED
NOV 27 1974
PUBLIC REFERENCE SECTION

Edlow International Company
ATTN: Mr. Jack Edlow
Suite 404-5
1100 17th Street, N. W.
Washington, D. C. 20035

Gentlemen:

Enclosed is Special Nuclear Material Import License No. SNM-1501 requested in your application dated October 29, 1974.

FOR THE ATOMIC ENERGY COMMISSION

L. C. Rouse

L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch No. 1
Directorate of Licensing

Enclosure:
Special Nuclear Material
Import License No. SNM-1501

31

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

COPY

License No.: SNM-1501
Docket No.: 70-1796
Date Issued: NOV 19 1974

SPECIAL NUCLEAR MATERIAL IMPORT LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, and Title 10, Code of Federal Regulations, Part 70, a license is hereby issued to Edlow International Company, Washington, D. C., authorizing the company to import from Australia a maximum of 4.1 kilograms of fissile plutonium in the form fo plutonium-aluminum fuel plates.

This license is issued in accordance with the application dated October 29, 1974, and supplement dated November 14, 1974 and will expire February 28, 1975.

This license is subject to the following conditions:

1. The licensee shall obtain all information from the foreign exporter necessary to complete the shipper's portion of Form AEC-741, "Nuclear Material Transfer Report." If the licensee is the receiver of the material, he shall record this shipper's information on the copy of the Form AEC-741 completed and sent to AEC pursuant to Section 70.54 of 10 CFR Part 70. If the licensee is not the receiver of the material, he shall provide the shipper's information to the receiver of the material for inclusion on the receiver's Form AEC-741.

2. The licensee shall notify the Materials and Plant Protection Operations Branch, Directorate of Regulatory Operations, immediately, by telephone or telegram, if entry of any import shipment authorized by this license is refused by the U. S. Bureau of Customs.

3. Each time material is imported, the licensee shall show the original of the license to U. S. Customs as authority for the import. The original of the license showing the imported quantity shall be surrendered to U. S. Customs when the final transaction under the license is completed. Except for the final transaction, a copy of the license showing the imported quantity shall be surrendered to U. S. Customs for each shipment. All surrendered documents shall be marked for immediate transmittal to the Directorate of Regulatory Operations, Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406.

4. For import shipment of 350 grams or more of plutonium, the licensee shall promptly notify the Directorate of Regulatory Operations, Region I by telephone, telegram or teletype, upon receiving notification that an import shipment has entered the country, giving the date that the import entered and the estimated time of arrival at the stated destination.

5. The licensee shall assure that any shipment of plutonium, shall be protected in transit after it arrives in this country in accordance with the provisions of 10 CFR Part 73.

FOR THE ATOMIC ENERGY COMMISSION

Original Signed by
Leland C. Rouse

L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch No. 1
Directorate of Licensing

COPY

AEC PUBLIC DOCUMENT ROOM

EDLOW INTERNATIONAL COMPANY
SUITE 404-5 1100 17TH STREET, N.W. WASHINGTON, D.C. U.S.A. 20036

October 29, 1974

RECEIVED OCT 31 1974

Chief, Fuel Fabrication and
Transportation Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Sir:

We hereby make application for the grant of a license to import not more than 4.1 kgs. plutonium in the form of plutonium aluminum fuel plates, as agents for the Australian Atomic Energy Commission. Copy of their Letter of Authorization enclosed.

This material is being imported as a return of lease material held in their account AU/L/2-2. The material will be shipped in one type 6M container to the U. S. Atomic Energy Commission facility operated by Atlantic Richfield in Richmond, Washington. We expect shipment to take place prior to the end of 1974, and hopefully during November.

Your usual expeditious handling of this matter would be greatly appreciated. Thanking you in advance, I remain,

NOV 01 1974

Very truly yours,

EDLOW INTERNATIONAL COMPANY

Jack Edlow
Vice President

JE:mtw
Enclosure

2.1.4

TELEPHONE: AREA CODE 202-833-8237 / TELEX WUI 64387

34

EMBASSY OF AUSTRALIA

IN REPLY QUOTE AE6.1442

23 October 1974

Mr. Jack Edlow
Vice President
Edlow International Inc.
1100 Seventeenth Street N.W.
WASHINGTON D.C. 20036

Dear Mr. Edlow,

I refer to previous discussions concerning the return of 4.075kg of plutonium in the form of plutonium aluminium fuel plates from the Australian Atomic Energy Commission to the United States Atomic Energy Commission.

As proposed earlier, I am now able to advise you that the AAEC wishes Edlow International to arrange the return of this material on their behalf. I should therefore be grateful if you would arrange for a three months lease of one only 110 gallon DOT-6M container from

Film Badge Fabricators Inc.
1201 Hilton Road
Knoxville. Tennessee.

The container should be forwarded immediately to the AAEC by air freight, the address being:

Australian Atomic Energy Commission
Research Establishment
New Illawarra Road
LUCAS HEIGHTS. N.S.W. 2232
Australia

I should be grateful if you would arrange for Film Badge Fabricators to advise me of the air way bill number and flight details when available so that I can arrange for the AAEC to take delivery of the container promptly on its arrival in Sydney.

I am awaiting further advice from the AAEC concerning the return of the fuel plates to USA, and shall write to you again as soon as this advice has been received.

Yours sincerely,

J. W. Pearce
First Secretary (Atomic Energy)

35

70-1796

AEC PUBLIC DOCUMENT ROOM

EDLOW INTERNATIONAL COMPANY
SUITE 404-5 1100 17TH. STREET, N.W. WASHINGTON, D.C. U.S.A. 20036

November 14, 1974

RECEIVED NOV 18 1974 Mail Reference Section
RECEIVED NOV 14 1974

Chief, Fuel Fabrication
and Transportation Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Sir,

We acknowledge receipt of telephone call from your staff regarding our October 29 application for import license for not more than 4.1 kgs. plutonium, on behalf of the Australian Atomic Energy Commission. We hereby certify that above material will be handled in accordance with 10 CFR Part 73 requirements, and will move under the auspices of the Edlow International approved plan for the transportation of special nuclear material.

We now look forward to receipt of our license.

Very truly yours,

EDLOW INTERNATIONAL COMPANY

Jack Edlow
Vice President

JE:mtw

RECEIVED NOV 14 1974

2.133

TELEPHONE AREA CODE 202 833-9227 / TELEX WUI 64787

36

70-1796

AEC PUBLIC DOCUMENT ROOM

EDLOW INTERNATIONAL COMPANY
SUITE 404-5 1100 17TH. STREET, N.W. ·WASHINGTON, D.C. U.S.A. 20036

November 4, 1974

RECEIVED
NOV 6 1974

Fuel Fabrication and Reprocessing
Directorate of Licensing
Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Sir:

Please refer to our application dated October 29, 1974, for the import of 4.1 kgs. Pu as plutonium aluminum fuel plates.

Note that the material is not going to Atlantic Richfield in Richmond, Washington, but Richland, Washington.

We apologize for the incorrect city notation and request that the correction be made on our application.

NOV 06 1974
REGULATORY MAIL SECTION
DOCKET CLERK

Most cordially yours,

EDLOW INTERNATIONAL COMPANY

(Miss) Diane Wright
Operations Manager

DW:mtw

cc

TELEPHONE: AREA CODE 202-833 8237 / TELEX WUI 64387

37

Public Document Room

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 15 1974

RECEIVED
APR 26 1974

L:FFRB:NTC
70-1613
SNM-1468

Transnuclear, Inc.
ATTN: Ms. Beverly Back
5205 Leesburg Pike
Falls Church, Virginia 22041

Gentlemen:

Enclosed is Special Nuclear Material Import License No. SNM-1468 requested in your application dated March 20, 1974.

Sincerely,

Robert J. Davis

for L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch
Directorate of Licensing

Enclosure:
As stated

38

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

COPY

License No.: SNM-1468

Docket No.: 70-1618

Date Issued: APR 15 1974

SPECIAL NUCLEAR MATERIAL IMPORT LICENSE

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This license is subject to the following conditions:

1. The licensee shall obtain all information from the foreign exporter necessary to complete the shipper's portion of Form AEC-741, "Nuclear Material Transfer Report." If the licensee is the receiver of the material, he shall record this shipper's information on the copy of the Form AEC-741 completed and sent to AEC pursuant to Section 70.54 of 10 CFR Part 70. If the licensee is not the receiver of the material, he shall provide the shipper's information to the receiver of the material for inclusion on the receiver's Form AEC-741.

2. The licensee shall notify the Materials and Plant Protection Operations Branch, Directorate of Regulatory Operations, immediately, by telephone or telegram, if entry of any import shipment authorized by this license is refused by the U. S. Bureau of Customs.

3. Each time material is imported, the licensee shall show the original of the license to U. S. Customs as authority for the import. The original of the license showing the imported quantity shall be surrendered to U. S. Customs when the final transaction under the license is completed. Except for the final transaction, a copy of the license showing the imported quantity shall be surrendered to U. S. Customs for each shipment. All surrendered documents shall be marked for immediate transmittal to the Directorate of Regulatory Operations, Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406.

COPY

4. For import shipment of 350 grams or more of U-233, plutonium, and/or U-235 contained in uranium enriched in the U-235 isotope 20% or above, and for import shipments of 5 kilograms or more of U-235 contained in uranium enriched in the U-235 isotope below 20%, the licensee shall promptly notify the Directorate of Regulatory Operations, Region I by telephone, telegram or teletype, upon receiving notification that an import shipment has entered the country, giving the date that the import entered and the estimated time of arrival at the stated destination.

5. The licensee shall assure that any shipment of plutonium, U-233, or U-235 contained in uranium enriched to 20% or more in the U-235 isotope shall be protected in transit after it arrives in this country in accordance with the provisions of 10 CFR Part 73.

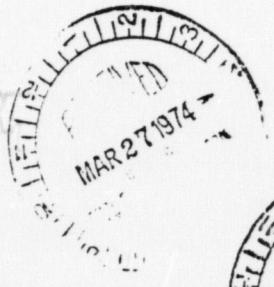
FOR THE ATOMIC ENERGY COMMISSION

R. J. Dube

L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch
Directorate of Licensing

70-1618

TRANSNUCLEAR, INC.





March 20, 1974

Mr. Crow
Fuel Fabrication and Reprocessing
Directorate of Licensing
4530 East West Highway
East West Tower Building
Bethesda, Maryland 20014

Dear Mr. Crow:

Please consider this letter an application for import license in accordance with 10 CFR 70.22 (c).

1). Applicant: TRANSNUCLEAR, INC.
5205 Leesburg Pile
Falls Church, Virginia 22041

2). Ultimate Consignee: Westinghouse Electric Corporation
Nuclear Fuel Division
Plutonium Fuel Development Lab.
Cheswick Avenue
Building 8, Gate D
Cheswick, Pennsylvania 15024



3). Intermediate Consignee:
TRANSNUCLEAR, INC.
5205 Leesburg Pike
Falls Church, Virginia 220.

4). This material is recovered plutonium from the Trino Reactor in Italy. The plutonium was reprocessed by Eurochemic in Mol, Belgium.

5). Material is privately owned and will be shipped from Eurochemic, Mol, Belgium to Westinghouse, Cheswick, Pennsylvania loaded in LLD-1 containers according to I.A.E.A. Certificate Number USA/4960/BF (copy enclosed). The Belgian validation of the I.A.E.A. Certificate will be submitted to the U.S. Department of Transportation prior to import of material.

0663

SKYLINE CENTER • 5205 LEESBURG PIKE • FALLS CHURCH VIRGINIA 22041
TELEPHONE: [illegible] • CABLE TRANSNUCLEAR • TELEX [illegible]

41

TRANSNUCLEAR, INC.

6). The total quantity of material to be imported is 140 kilograms plutonium. The first shipment is planned to arrive in May, 1974 and the last shipment in 1975. Therefore, please issue this license for a period of 18 months.

7). Material will be imported and delivered to Westinghouse under our approved security plan.

If there are any questions, please contact this office.

Very truly yours,

Beverly Back
Traffic Coordinator

Enslosure: as stated

BB/vm

FEB 12 1975

DISTRIBUTION:
LCRouse
WTCrow
IE:HQ (2)
HWerner
RGPage
ACabell
BBrooks
LNUnderwood
NMSS: R/F
MF:FF1 R/F
MF R/F

MF:FF1:WTC
70-1041
SNM-1510

Edlow International Company
ATTN: Mr. Jack Edlow
Suite 404-5
1100 17th Street, N. W.
Washington, D. C. 20036

Gentlemen:

Enclosed is Special Nuclear Material Import License No. SNM-1510 requested in your application dated December 13, 1974.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed by
Leland C. Rouse

L. C. Rouse, Chief
Fuel Fabrication and
Reprocessing Branch No. 1
Division of Materials and
Fuel Cycle Facility Licensing

Enclosure:
SNM License No. 1510

OFFICE	MF:FF1	MF:FF1				
X7427 SURNAME	WTCrow:mh	LCRouse				
DATE	2/ /75	2/ /75				

Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1974-526-166

"C"

43

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

COPY

License No.: SNM-1510

Docket No.: 70-1841

Date Issued: FEB 12 1975

SPECIAL NUCLEAR MATERIAL IMPORT LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, and Title 10, Code of Federal Regulations, Part 70, a license is hereby issued to Edlow International Company, Washington, D. C., authorizing the company to import from Great Britain a maximum of 130 kilograms of plutonium containing not more than 100 kilograms of fissile plutonium in the form of plutonium oxide.

This license is issued in accordance with the application dated December 19, 1974, and supplement dated January 3, 1975, and will expire September 30, 1975.

This license is subject to the following conditions:

1. The licensee shall obtain all information from the foreign exporter necessary to complete the shipper's portion of Form AEC-741, "Nuclear Material Transactions Report." If the licensee is the receiver of the material, he shall record both the shipper's and receiver's information on the Form AEC-741 and transmit pursuant to Section 70.54 of 10 CFR Part 70. If the licensee is not the receiver of the material, he shall provide the shipper's information to the receiver of the material for inclusion on the receiver's Form AEC-741.

2. The licensee shall notify the Materials and Plant Protection Branch, Office of Inspection and Enforcement, immediately, by telephone or telegram, if entry of any import shipment authorized by this license is refused by the U. S. Bureau of Customs.

3. Each time material is imported, the licensee shall show the original of the license to U. S. Customs as authority for the import. The original of the license showing the imported quantity shall be surrendered to U. S. Customs when the final transaction under the license is completed. Except for the final transaction, a copy of the license showing the imported quantity shall be surrendered to U. S. Customs for each shipment. All surrendered documents shall be marked for immediate transmittal to the Office of Insepction and Enforcement, Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406.



COPY

44

Date Issued: FEB 12 1975

4. For import shipment of 350 grams or more of plutonium, the licensee shall promptly notify the Office of Inspection and Enforcement, Region I by telephone, telegram or teletype, upon receiving notification that an import shipment has entered the country, giving the date that the import entered and the estimated time of arrival at the stated destination.

5. The licensee shall assure that any shipment of plutonium shall be protected in transit in accordance with the provisions of 10 CFR Part 73 at all times after it arrives in this country.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed by
Leland C. Rouse

L. C. Rouse, Chief
Fuel Fabrication and Reprocessing
Branch No. 1
Division of Materials and
Fuel Cycle Facility Licensing

COPY

45

OFFICE OF THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

RECEIVED
FEB 27 1974

IAEA CERTIFICATE OF COMPETENT AUTHORITY

Type B Fissile Radioactive Material Package Design

Certificate Number USA/4960/BF

This establishes that the packaging designs described herein, when loaded with the authorized radioactive contents, have been certified by the National Competent Authority of the United States as meeting the regulatory requirements for Type B packaging for fissile radioactive materials as prescribed in IAEA1/ Regulations and §§ 49 CFR 173.393b, 173.396(c)(3); 46 CFR 146.19-100; and 14 CFR 103 of the USA2/3/4/ Regulations for the transport of radioactive materials.

I. Package Identification - Models KKD-1 or LLD-1, described on Dow Chemical Company Drawing 12720-41-A or Union Carbide Drawings 1-7745-76 and 2-7552-76B.

II. Packaging Description - The packaging authorized by this certificate consists of an open framework birdcage in which the "bird" containing a 5" I.D., 12" long U.S. DOT Specification 2R pipe with a pipe-plug, "O" -ring closure, is a gasketed, breech-lock and set-screw closured steel vessel (13-3/8" by 6-1/8" diameter or 15" by 6-3/8" diameter). The vessel is welded to and centrally supported within a 16" by 25" rectangular framework of 3/4" steel tubing. Plutonium contents are further contained within sealed metal vessels (cadmium plated for plutonium loadings in excess of 4.5 kilograms).

For Fissile Class II shipments, the birdcage must be enclosed within an outer box of wood, metal or fiberboard; or all open outer surfaces must be closed by firmly attached metal sheet or rigid perforated metal screen.

The gross weight of the package is 100-150 pounds.

III. Authorized Radioactive Contents - The authorized contents consist of fissile radioactive materials n.o.s. or radioactive materials n.o.s. as:

(a) Not more than 7 kilograms of plutonium as metal or alloy,

(b) Not more than 4.5 kilograms of plutonium oxide,

(c) Not more than 7 kilograms of enriched uranium or uranium-plutonium alloy (at any U-235 enrichment),

(d) Not more than 20 kilograms of U-235 as uranium of any U-235 enrichment,

(e) Not more than 4.5 kilograms of plutonium with a maximum total thermal decay energy of 21 watts, or

"D"

(f). Not more than Type B quantities of Americium-241 as oxide contained in a glass ampoule and sealed in a leak-tight container with the DOT Spec. 2R container. (For this loading, the fissile material content may not exceed 15 grams).

For contents listed in (a), (b) and (c) above, shipments are authorized as Fissile Class II with a transport index of 1.3 assigned to each package (unless external radiation levels dictate a higher assignment).

For contents listed in (d) above, shipments are authorized as Fissile Class III, with no more than 50 packages per transport vehicle stowage area.

For contents listed in (e) above, shipments are authorized as Fissile Class II with a transport index of 0.4 assigned to each package (unless external radiation levels dictate a higher assignment) or Fissile Class III with no more than 395 packages per transport vehicle or stowage area.

IV. General Conditions -

a. Each user of this certificate must have in his possession a copy of this certificate.

b. Each user of this certificate, other than Transnuclear, Inc., Falls Church, Virginia shall register his identity in writing to the Office of Hazardous Materials, U. S. Department of Transportation, Washington, D. C. 20690.

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

V. Marking and Labeling - The package must bear the marking USA/4960/BF as well as the other marking and labels prescribed by the USA Regulations.

VI. Expiration Date - This certificate, unless renewed, expires on March 15, 1977.

This certificate is issued in accordance the requirements of the IAEA and USA Regulations and in response to the February 6, 1974 petition by Transnuclear, Inc., Falls Church, Virginia, and in consideration of the associated information provided in the following U. S. Atomic Energy Commission Operating Office Approvals: Albuquerque, July 13, 1967; Oak Ridge, Number 69-018, November 19, 1969; Savannah River, April 29, 1971; and Richland, January 5, 1973.

Certified by:

A. W. Grella

A. W. Grella, Chief
Technology Division
Office of Hazerdous Materials
U. S. Department of Transportation

February 22, 1974
(DATE)

47

APPENDIX A

RECENT SHIPMENTS OF PLUTONIUM THROUGH KENNEDY AIRPORT

Date		Wt.
2/26/74	Export	12.5
4/3/74	Export	24.7
7/29/74	Import	48.3
9/27/74	Export	36.5
10/19/74	Export	36.5
2/25/75	Import	45.1

"E"

(212) 488-7562

March 28, 1975

Honorable Dixie Lee Ray
Chairman
Nuclear Regulatory Commission
Washington, D.C.

Re: Transportation of Nuclear Materials Via Air in New York City Metropolitan Region

Dear Chairman Ray?

The Attorney General of the State of New York has over the past several weeks conducted an investigation into the shipment of certain nuclear materials by air into and through the New York City metropolitan region. We are most pleased to note that the Commission has recently suspended issuing licenses for the import and export of such nuclear materials pending review of pertinent regulations. It is somewhat distressing however, that shipments previously licensed under the very regulations now being reviewed, are still expected to be brought in through the New York area.

In this regard would you please supply us with responses to the following inquiries:

1. Has the Commission or its predecessor agency filed pusuant to the National Environmental Policy Act, 42 U.S.C. § 4332(2)(C), an environmental impact statement assessing the effects and impact of the promulgation and implementation of the Commission's rules, regarding the export-import by air and related transport of nuclear materials

a) through the New York metropolitan region and surrounding areas or

b) through the United States and its territories generally?

"F"

49

If the Commission has done so, please supply us with copies of said statements in their final or most recently drafted form.

2. Has the Commission conducted hearings on the promulgation and implementation of the regulations, procedures etc., referred to in 1, above, or otherwise solicited comment from the public, federal, state and local governmental agencies, or notified such parties of their promulgation and implementation? If so when and where were such hearings, solicitations or notices held or published?

Due to the exigencies of this issue of transportation of plutonium and other nuclear materials we would appreciate your response to these inquiries within ten days of receipt of this letter.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JOHN F. SHEA, III
Assistant Attorney General

JFS:dg

50

(212) 488-7562

April 7, 1975

Hon. Samuel J. Chilk
Secretary
Nuclear Regulatory Commission
1717 H Street, N.W.
Washington, D.C. 20555

Re: Transportation of Nuclear Materials Via Air in New York City Metropolitan Region

Dear Secretary Chilk:

Reference is made to our telephone conversation of this morning regarding my letter to the Commission dated March 28, 1975. In view of the delayed receipt of that letter it is understandable that there will be some corresponding delay in the Commission's formulation of a reply. However, as mentioned in our earlier correspondence, these matters are of serious and immediate concern to the State of New York, accordingly, a response from the Commission is respectfully requested to be made on or by April 14, 1975.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JFS:nv

JOHN F. SHEA III
Assistant Attorney General

51

STATE OF NEW YORK
DEPARTMENT OF LAW
TWO WORLD TRADE CENTER
NEW YORK, N.Y. 10047
TELEPHONE: 212-488-7562

LOUIS J. LEFKOWITZ
ATTORNEY GENERAL

PHILIP VEINBERG
ASSISTANT ATTORNEY GENERAL
IN CHARGE OF
ENVIRONMENTAL PROTECTION
BUREAU

March 31, 1975

Honorable Henry A. Kissinger
Secretary of State
Department of State
New State Building
2201 C Street, N.W.
Washington, D.C. 20520

Re: Transportation of Nuclear Materials Via Air in New York City Metropolitan Region

Dear Secretary Kissinger:

The Attorney General of the State of New York has over the past several weeks conducted an investigation into the shipment of certain nuclear materials by air into and through the New York City metropolitan region. We are most pleased to note that the Nuclear Regulatory Commission has recently suspended issuing licenses for the import and export of such nuclear materials pending review of pertinent regulations. It is somewhat distressing however, that shipments previously licensed under the very regulations now being reviewed, are still expected to be brought in through the New York area.

In this regard would you please supply us with responses to the following inquiries:

1. Has the Department of State filed, pursuant to the National Environmental Policy Act, 42 U.S.C. § 4332(2)(C), an environmental impact statement assessing the effects and impact of the promulgation and implementation of the Department of State's rules, regarding the export-import by air and related transport of nuclear materials

"B"

52

a) through the New York metropolitan region and surrounding areas, or

b) through the United States and its territories generally?

If the Department of State has done so, please supply us with copies of said statements in their final or most recently drafted form.

2. Has the Department of State conducted hearings on the promulgation and implementation of the regulations, procedures, etc., referred to in 1, above, or otherwise solicited comment from the public, federal, state and local governmental agencies, or notified such parties of their promulgation and implementation? If so when and where were such hearings, solicitations or notices held or published?

Due to the exigencies of this issue of transportation of plutonium and other nuclear materials we would appreciate your response to these inquiries within ten days of receipt of this letter.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JFS:rab

JOHN F. SHEA, III
Assistant Attorney General

53

(212) 488-7562

March 28, 1975

Honorable William T. Coleman
Secretary of Transportation
400 SEventh STreet S.W.
Washington, D.C. 20590

Re: Transportation of Nuclear Materials Via Air in New York City Metropolitan Region

Dear Secretary Coleman:

The Attorney General of the State of New York has over the past several weeks conducted an investigation into the shipment of certain nuclear materials by air into and through the New York City metropolitan region. We are most pleased to note that the Nuclear Regulatory Commission has recently suspended issuing licenses for the import and export of such nuclear materials pending review of pertinent regulations. It is somewhat distressing however, that shipments previously licensed under the very regulations now being reviewed, are still expected to be brought in through the New York area.

In this regard would you please supply us with responses to the following inquiries:

1. Has the Department of Transportation filed pusuant to the National Environmental Policy Act, 42 U.S.C. § 4332(2)(C), an environmental impact statement assessing the effects and impact of the promulgation and implementation of the Department's rules, regarding the export-import by air and related transport of nuclear materials

a) through the New York metropolitan region and surrounding areas or

b) through the United States and its territories generally?

"H"

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If the Department has done so, please supply us with copies of said statements in their final or most recently drafted form.

2. Has the Department conducted hearings on the promulgation and implementation of the regulations, procedures etc., referred to in 1, above, or otherwise solicited comment from the public, federal, state and local governmental agencies, or notified such parties of their promulgation and implementation? If so when and where were such hearings, solicitations or notices held or published?

Due to the exigencies of this issue of transportation of plutonium and other nuclear materials we would appreciate your response to these inquiries within ten days of receipt of this letter.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JOHN P. SHEA, III
Assistant Attorney General

JPS:dg

55

(212) 488-7562

March 28, 1975

Honorable Robert D. Timm
Chairman
Civil Aeronautics Board
1825 Connecticut Avenue
Washington, D.C. 20428

Re: Transportation of Nuclear Materials Via Air in New York City Metropolitan Region

Dear Chairman Timm:

The Attorney General of the State of New York has over the past several weeks conducted an investigation into the shipment of certain nuclear materials by air into and through the New York City metropolitan region. We are most pleased to note that the Nuclear Regulatory Commission has recently suspended issuing licenses for the import and export of such nuclear materials pending review of pertinent regulations. It is somewhat distressing however, that shipments previously licensed under the very regulations now being reviewed, are still expected to be brought in through the New York area.

In this regard would you please supply us with responses to the following inquiries:

1. Has the Civil Aeronautics Board filed pusuant to the National Environmental Policy Act, 42 U.S.C. § 4332(2)(C), an environmental impact statement assessing the effects and impact of the promulgation and implementation of the Board's rules, regarding the export-import by air and related transport of nuclear materials

a) through the New York metropolitan region and surrounding areas or

b) through the United States and its territories generally?

"I"

56

If the Board has done so, please supply us with copies of said statements in their final or most recently drafted form.

2. Has the Board conducted hearings on the promulgation and implementation of the regulations, procedures etc., referred to in 1, above, or otherwise solicited comment from the public, federal, state and local governmental agencies, or notified such parties of their promulgation and implementation? If so when and where were such hearings, solicitations or notices held or published?

Due to the exigencies of this issue of transportation of plutonium and other nuclear materials we would appreciate your response to these inquiries within ten days of receipt of this letter.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JOHN F. SHEA, III
Assistant Attorney General

JFS:dg

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(212) 488-7562

March 28, 1975

Honorable Alexander P. Butterfield
Chairman
Federal Aviation Administration
800 Independent, S.W.
Washington, D.C. 20591

Re: Transportation of Nuclear Materials Via Air in New York City Metropolitan Region

Dear Chairman Butterfield:

The Attorney General of the State of New York has over the past several weeks conducted an investigation into the shipment of certain nuclear materials by air into and through the New York City metropolitan region. We are most pleased to note that the Nuclear Regulatory Commission has recently suspended issuing licenses for the import and export of such nuclear materials pending review of pertinent regulations. It is somewhat distressing however, that shipments previously licensed under the very regulations now being reviewed, are still expected to be brought in through the New York area.

In this regard would you please supply us with responses to the following inquiries:

1. Has the Federal Aviation Administration filed pusuant to the National Environmental Policy Act, 42 U.S.C. § 4332(2)(C), an environmental impact statement assessing the effects and impact of the promulgation and implementation of the Administration's rules, regarding the export-import by air and related transport of nuclear materials

a) through the New York metropolitan region and surrounding areas or

b) through the United States and its territories generally?

"J"

58

If the Administration has done so, please supply us with copies of said statements in their final or most recently drafted form.

2. Has the Administration conducted hearings on the promulgation and implementation of the regulations, procedures etc., referred to in 1, above, or otherwise solicited comment from the public, federal, state and local governmental agencies, or notified such parties of their promulgation and implementation? If so when and where were such hearings, solicitations or notices held or published?

Due to the exigencies of this issue of transportation of plutonium and other nuclear materials we would appreciate your response to these inquiries within ten days of receipt of this letter.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JOHN F. SHEA, III
Assistant Attorney General

JFS:dg

59

STATE ACTS TO END PLUTONIUM CARGO

Carey, Reid and Lefkowitz Ask U.S. to Bar Shipment

By RICHARD SEVERO

Governor Carey and two other top state officials have begun action to halt any future shipments of plutonium through the state in general and Kennedy International Airport in particular.

Besides the Governor, the effort involves Ogden R. Reid, Commissioner of Environmental Conservation, and Attorney General Louis J. Lefkowitz, all of whom are urging the Federal Government to revoke any outstanding licenses that it may have issued for such shipment.

There has been no response as yet from the Federal Government, but yesterday the Rochester Gas and Electric Company announced that it was terminating its order for 200 pounds of plutonium oxide that it had wanted for research purposes from a British concern. The shipment, which was licensed only last Monday by the Nuclear Regulatory Commission in Washington, would have been flown to Kennedy and then transshipped to Rochester.

Telegrams Dispatched

Both Governor Carey and Commissioner Reid sent telegrams to William A. Anders, chairman of the Nuclear Regulatory Commission, urging immediate suspension or cancellation of licenses for shipping plutonium through Kennedy from Europe. At least two licenses are believed to be pending.

"Why in God's name anybody would want to ship anything as dangerous as plutonium through New York City is incomprehensible," said Philip Weinberg, chief of Mr. Lefkowitz's Environmental Bureau.

Mr. Weinberg disclosed yesterday that the Attorney General had filed a motion to intervene in a suit brought by the Air Line Pilots Association International against the Civil Aeronautics Board.

"Plutonium," the pilots assert, "is regarded by most toxicologists as the most deadly element available in large amounts, having as well the longest duration of toxicity. The characteristics of this material make it a perfect weapon for terrorism and sabotage."

Proof Requested

In addition to supporting the pilots, who feel that they have a right to refuse to carry dangerous cargo, Mr. Lefkowitz's aides have written to five Federal agencies requesting proof that environmental impact statements were filed and approved prior to issuance of the licenses. The 200 pounds of plutonium already known to have been handled by Kennedy were transshipped by truck to a plant in Cheswick, Pa., near Pittsburgh.

The Attorney General was joined in this yesterday by Robert Low, New York City's Environmental Protection Administrator.

The Attorney General's office and other critics fear traffic accidents or a hijacking, since some experts say that there is enough available information so that homemade nuclear bombs might be fashioned. Another hazard is that even minute quantities of plutonium can cause cancer.

Commissioner Reid sent a telegram to Mr. Anders yesterday reminding him that since the Nuclear Regulatory Commission "has already directed a halt in the processing of new applications . . . pending a complete review of the matter, it is inconsistent to allow previous licensed shipments to continue."

"The residents of the State of New York should not be exposed to the risks inherent in the transportation of this highly toxic material prior to a complete review of the necessary safeguards to insure its safe transport," it added.

"k" 60

DEPARTMENT OF STATE

Washington, D.C. 20520

BUREAU OF OCEANS AND INTERNATIONAL
ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

April 8, 1975

Mr. John F. Shea, III
Assistant Attorney General
Department of Law
State of New York
Two World Trade Center
New York, N. Y. 10047

Dear Mr. Shea:

Your letter to Dr. Kissinger of March 31 concerning the transportation of nuclear materials via air in New York City metropoli[illegible] region has been referred to me for reply. I shall be in further touch with you as soon as I have the answers to your questions in hand.

Sincerely,

Lindsey Grant
Acting Deputy Assistant Secretary
for Environment and Population

"L"

61

DEPARTMENT OF STATE

Washington, D.C. 20520

BUREAU OF OCEANS AND INTERNATIONAL
ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

April 23, 1975

Mr. John F. Shea,III
Assistant Attorney General
Department of Law
State of New York
Two World Trade Center
New York, N. Y. 10047

Dear Mr. Shea:

I refer to your letter of March 31 to Dr. Kissinger and to my interim reply of April 8.

The Department of State has not taken a role in licensing the movement of nuclear materials by air or in any corollary environmental assessment process.

I understand that you have addressed an inquiry to the Nuclear Regulatory Commission similar to that which you sent to the Department of State, and that that Commission will be responding to your inquiry in the near future.

Sincerely,

Lindsey Grant
Acting Deputy Assistant Secretary
for Environment and Population

"M"

62

PW

CIVIL AERONAUTICS BOARD
WASHINGTON, D.C. 20428

IN REPLY REFER TO: B-1-63b

April 14, 1975

RECEIVED
BY MAIL
APR 1 0 1975
DEPARTMENT OF LAW
NEW YORK CITY OFFICE

Honorable Louis J. Lefkowitz
Attorney General
State of New York
Two World Trade Center
New York, New York 10047

Dear Mr. Attorney General:

Thank you for your letter of March 28, 1975, regarding the regulations governing the export and import of nuclear materials by air.

The Board issues no regulations covering export or import of nuclear articles. The duty and authority of the Board in this area is limited to passing upon tariffs and embargoes filed by the air carriers covering their transportation of hazardous materials, including nuclear articles, which must be in conformity with the safety regulations issued by the Federal Aviation Administration.

We understand, however, that regulations governing the export or import of such materials are under the purview of the Nuclear Regulatory Commission, and consequently, we are forwarding your inquiry to that agency.

Sincerely,

Richard J. O'Melia

Richard J. O'Melia
Acting Chairman

"N"

63

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

April 9, 1975

Honorable John F. Shea, III
Assistant Attorney General
New York, New York 10047

Dear Mr. Shea:

Mr. Butterfield has asked this office to reply to your March 28 letter requesting information relative to the environmental assessment of the export-import of nuclear materials.

The Federal Aviation Administration (FAA) does not license or regulate the import or export of nuclear materials. This function is performed by the Nuclear Regulatory Commission and your specific questions should be sent to that office.

The FAA regulates the packaging, marking, and labeling of hazardous material including nuclear materials in any civil aircraft in the U. S., and in civil aircraft of U. S. registry anywhere in air commerce. The FAA and Department of Transportation (DOT) regulations are found in Title 14 Code of Federal Regulations (CFR), Part 103, and Title 49 CFR, Parts 170 through 179.

The FAA has undertaken a review of the carriage of radioactive materials, which includes nuclear materials. An environmental impact assessment is being prepared relative to proposed rulemaking as recommended in an Atomic Energy Commission study of July 1974. This assessment will be circulated for comment in the near future.

The transportation of nuclear materials involves all modes of transportation. The Office of Hazardous Materials of the DOT should also be able to help you with the transportation aspects of your inquiry as they deal with regulations affecting shippers as well as all modes of transportation.

Sincerely,

J. A. Ferrarese

J. A. FERRARESE
Acting Director, Flight Standards Service

"O"

64

OFFICE OF THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

ASSISTANT SECRETARY

APR 21 1975

John F. Shea, III, Esquire
Assistant Attorney General
New York Department of Law
Environmental Protection Bureau
New York, New York 10047

Dear Mr. Shea:

Secretary of Transportation Coleman has asked me to reply to your letter of March 28, in which you raised several questions pertaining to the current regulations of the Department of Transportation (DOT) concerning the transportation by air of special nuclear materials, such as plutonium, and the National Environmental Policy Act (NEPA).

Currently effective regulatory standards governing the safe packaging and transportation of radioactive materials are contained in 49 CFR, Part 173 and 14 CFR, Part 103. Because all the applicable regulations were promulgated prior to the effective date of NEPA by the various agencies then responsible for the regulation of the safe transportation of hazardous materials, studies of environmental assessment were not prepared in connection therewith.

Although certain editorial changes have been made by DOT in some of the regulations subsequent to the effective date of NEPA, and others are currently pending, none of these amendments has in our judgment constituted a major Federal action significantly affecting the human environment within the meaning of NEPA.

In all cases, the original promulgation and amendment of these various regulations have been made in conformity with the applicable provisions of the Administrative Procedure Act. For specific reference to the procedures observed in each case, I would refer you to the applicable Federal Register citations in 49 CFR, Part 173 and 14 CFR, Part 103.

The only non-editorial regulatory action that DOT has taken subsequent to the effective date of NEPA is a notice of proposed rule making to implement Section 108 of the

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Hazardous Materials Transportation Act of 1974, PL 93-633, 49 U.S.C. 1807 (Supp. 1975). In this, Congress provided that only certain radioactive materials could be transported by passenger-carrying aircraft and directed DOT to implement this provision by appropriate administrative rules. A rule making to implement Section 108 was instituted on January 29, 1975, 40 Federal Register 516465, and the proposed rule and the comments received thereupon are currently under DOT's consideration with the publication of a final amendment expected shortly. A draft environmental assessment was prepared by the Federal Aviation Administration (FAA) in connection with this rule making and is available for public inspection in FAA regulatory docket No. 14249. A copy is enclosed for your information.

I should also add that, based upon recent recommendations made by the Atomic Energy Commission, DOT plans in the near future to institute rule making procedures to consider a major revision of the currently effective rules governing the transportation of all radioactive materials by air. In conformity with NEPA, a draft environmental impact statement is being prepared by FAA, which will be available for public inspection and comment in the near future.

Let me assure you that DOT shares your concern over the environmental consequences of the regulation of the safe transportation of hazardous materials and that our regulatory actions will in the future, as they have in the past, continue to adhere to NEPA.

Sincerely,

Ben Davis

Benjamin O. Davis, Jr.
Assistant Secretary for Environment,
Safety and Consumer Affairs

Enclosures

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
FLIGHT STANDARDS SERVICE
DRAFT ENVIRONMENTAL ASSESSMENT

Carriage of Radioactive Materials

I. Federal Action.

The Federal Aviation Administration (FAA) proposes to amend Part 103 of the Federal Aviation Regulations (FARs) to limit the carriage of radioactive materials to: (1) those intended for use in, or incident to, research or medical diagnosis or treatment; and (2) those shipments of radioactive materials that meet requirements of the regulations of the Office of the Secretary of Transportation which exempt them from packaging, marking, and labeling requirements and from the applicability of Part 103.

II. Purpose and Background of Action.

The purpose of the FAA's action is to implement Title I of the Transportation Safety Act of 1974 to adequately protect the public against the risks to life and property which are inherent in the transportation of hazardous materials in air commerce. The Transportation Safety Act of 1974 (P.L. 93-633), herein referred to as the Act, became effective on January 3, 1975, and directs the Secretary of Transportation to issue regulations within 120 days with respect to the transportation of radioactive materials on any passenger-carrying aircraft in air commerce. Section 108 of the Act provides: "Such regulations shall prohibit any transportation of radioactive materials on any such aircraft unless the radioactive materials involved are intended for use in, or incident to,

research or medical diagnosis or treatment, so long as such materials as prepared for and during transportation do not pose an unreasonable hazard to health and safety. The Secretary shall further establish effective procedures for monitoring and enforcing the provisions of such regulations."

"Radioactive materials" are defined as "any material or combination of materials which spontaneously emit ionizing radiation. The term does not include materials in which: (1) the estimated specific activity is not greater than 0.002 microcuries per gram of material; and (2) the radiation is distributed in an essentially uniform manner."

Title 49 CFR 170-189 was originally developed by the USAEC, the ICC, FAA, U.S. Coast Guard, and industry personnel within the atomic energy and transportation fields and with the participation by the public under the Administrative Procedures Act. Also, the Department of Transportation regulations incorporated the recommended regulations of the International Atomic Energy Agency (IAEA). The regulatory scheme set forth in 49 CFR Parts 170-189 provides for the control of the potential hazards to transportation workers, passengers, the general public, and other cargo such as undeveloped photographic film. The regulations were developed after considering three basic factors of: (1) relative hazard potential; (2) packaging performance; and (3) the transportation environment. Title 49 CFR Parts 170-189 provides a scheme for allowing sufficient emphasis to be placed not only on carriage during the normal

conditions of transportation but also on the environmental conditions which a package might encounter in an accident.

Since the potential hazards in the shipment of radioactive materials are controlled, there is no restriction under the present regulation on the shipment of radioactive material on passenger-carrying aircraft that is based upon the intended use of the material. At present, there are limits on the amount of radioactive material which can be carried on passenger aircraft according to the amount of radioactivity contained within a package and the amount of radiation emitted from a package. Large quantities of radioactivity (49 CFR 173.389(b)) in a single package are not permitted on a passenger-carrying aircraft (14 CFR 103.19(d)). Radioactive shipments are limited to a per package radiation dose rate of 200 millirem per hour at any point on the external surface and a transport index (TI) of 10 (49 CFR Parts 173.389(i) and 173.393(i)). Also, the total radioactive material aboard any aircraft is limited to 50 TI (FAR 103.19(b)) and minimum separation distances are required between the radioactive materials and people, animals, and film (FAR 103.23(a)). The minimum distances limit exposure to a maximum dose rate of approximately 4 millirem per hour at any one passenger seat. Nevertheless, in accordance with the Congressional and agency objective of reducing the exposure to the lowest practical level, the FAA is further restricting the carriage of radioactive material aboard passenger-carrying aircraft. The regulations will limit carriage based upon the intended use of the material, carriage to be permitted only if the material is used in or incident to research or medical diagnosis or treatment.

With regard to small quantities, the present FARs do not apply to radioactive materials and radioactive devices which meet those requirements of the Office of the Secretary of Transportation in 49 CFR 173.391 exempting these materials from packing, marking, and labeling requirements for shipment by rail express (FAR 103.1(c)(4)). Radioactive materials in the small quantities specified by 49 CFR 173.391 can be carried aboard passenger aircraft and in the passenger compartment when packaged as required for the exemption.

Practically all materials are radioactive to some degree. It was, therefore, necessary to define some limit of radioactivity below which materials will not be regarded as radioactive for the purpose of the transport regulation. In this respect, Congress in the Act adopted 0.002 microcuries per gram irrespective of the toxicity hazard group to which the radionuclides belong. (This is the standard incorporated into the regulations of the Secretary of Transportation in 1968 49 CFR 173.389(e).) Without the use of exemptions, this low limit brings within the scope of the regulations materials which have been in common use and transport for many years and which do not warrant the precautions set out in regulations for the transport of radioactive materials with much higher activity. Certain luminesced articles, such as aircraft instruments, furnish an example. In addition, the 0.002 microcurie per gram limit brings within the ambit of the regulations tiny quantities of radioactive materials or other substances slightly contaminated with radioactive materials which could not possibly constitute a significant hazard during transport.

The FAA recognizes that while some materials contain tiny quantities of radioactive materials or other substances slightly contaminated with radioactivity they could not possibly constitute a significant hazard during transport. These items or substances include time pieces or hands or dials containing radioactive by-product material, lock illuminators, precision balances, automobile shift quadrants, marine compasses, thermostat dials and pointers, electron tubes, ionizing radiation detection instruments, gas and aerosol detectors, miscellaneous other self-luminous products, incandescent gas mantles, welding rods, some types of electric lamps, germicidal lamps, sun lamps for outdoor or industrial lighting, glazed ceramic tableware, glassware and glass enamel, some photographic films, counterweights for aircraft, depleted uranium used as shielding, optical lenses, fire detection devices, etc. The regulations of the Secretary of Transportation, 49 CFR Part 173.391, set forth quantity limits to assure that these and similar products and materials cannot constitute a radiation hazard during transportation. It is the FAA's intent to avoid needless application of its regulations as a whole to those packages which the Department of Transportation has already identified as requiring only elementary precaution.

Small quantities of radioactive materials and radioactive devices which are now exempt from the applicability of Part 103 are limited to those packed strong tight packages that will not permit leakage of radioactive materials under conditions normally incident to transportation. The dose rate at the surface of the package cannot exceed 0.5 millirem

per hour. This is an equivalent TI of zero. This exemption has been in effect since 1968 and has never been a factor in any accident or incident in any mode of transportation. The proposed regulation would permit the continued shipment of these small quantities aboard passenger-carrying aircraft regardless of the intended use of the material.

III. Impact on the Environment.

One of the conditions attached to such exemption for small quantities in 49 CFR 173.391 is the requirement that the package must be such "that there can be no leakage of radioactive materials under conditions normally incident to transport," i.e., in the absence of an accident. This is an indispensable condition. However, there is a difference between such packaging and packaging incorporating Type A or Type B containment features. The latter has to be specifically designed and constructed to satisfy the more detailed requirements set out in 49 CFR 173.389(j) and (k) and is explicitly required to maintain its efficiency under accident conditions or handling mishap as well as under conditions normally incident to transport. The commercial type packaging which will continue to be allowed for exempt quantities cannot be expected to contribute to containment to this extent in accident conditions. In addition, such packages are not themselves required to be labeled and accordingly, may be more liable to suffer minor mishap than packages carrying radioactive warning labels. Therefore, in assessing the environmental impact, it is prudent to assume that the packaging for exempt quantities would contribute nothing to their containment in event of mishap in handling or accident, that is, the whole of the contents would escape.

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A further assumption in the assessment of the environmental impact of exempt packages is that 0.001 of the contents might be taken into the body by any one person.*

On the assumption that the complete contents of a package escapes as the result of an accident, such as damage by a fork lift to a package of small quantities as found in 49 CFR 173.391, the radiation dose rate received would be about 3 rem. This is the allowable occupational dose a worker may receive during one calendar quarter.

Thus, if this occurred, the dose rate would still be within allowable tolerances. Therefore, the effect on the environment resulting from small quantities of radioactive materials and radioactive devices in an accident would be negligible. It should be stressed that to the agency's knowledge these exempt radioactive materials have not been a factor in any aircraft accident or incident, nor to our knowledge has it exposed passengers to any undue radiation.

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*This assumption was made by the United Kingdom Atomic Energy Authority: "The Classification of Radionuclides For Transport Purposes and the Derivation of Activity Limits In Relation to Package Requirements." Harwell Didcot, Berkshire (1963). The assumption has been carried forward by the International Atomic Energy Agency and the Nuclear Regulatory Commission and theDepartment of Transportation. The assumption is that 0.001 of the escaped contents might be ingested or in some way taken into the body. Since it is also assumed that the entire contents of exempt packages will escape in case of accident, it follows that 0.001 of the total contents of the package will be absorbed.

During normal transport, the effect on the human environment resulting from small quantities of radioactive material would be clearly negligible. The limiting dose rate (0.5 millirem) from the surface of a small quantity of radioactive materials or radioactive devices is equivalent to the dose rate emanating from many wristwatches, pocket watches, and other time pieces with luminous dials.

Radioactive materials intended for use in or incident to research or medical diagnosis or treatment will continue to be subject to the Type A or B packaging requirements of the regulations of the Secretary of Transportation, 49 CFR 173.389(j) and (k). The quantity limitations of the regulations (49 CFR 173.389(l)) are applicable and they will continue to be limited by the transport index per package and per aircraft requirements. (Maximum of 10 TI per package, 50 TI per aircraft in accordance with separation limitations as per 14 CFR 103.23(a).) This material as with other hazardous substances regulated by the Department of Transportation, cannot be carried in the passenger compartment or in any area accessible to passengers, 14 CFR 103.31(a)(f). If the packages are prepared for shipment in accordance with existing regulations and transported in accordance with those regulations, a passenger-carrying aircraft carrying radioactive materials will not present an unreasonable hazard to health and safety.

Since the development of nuclear powered heart pacemakers and the use of radiopharmaceuticals, the need has now arisen to exempt human beings and animals with an implanted medical device, such as a heart

pacemaker, that contains radioactive material or with pharmaceuticals that have been injected or ingested. Pacemakers, by design, have the nuclear material incapsulated so that the dose rate at eight inches is less than background radiation and the capsule will withstand the heat of cremation or an aircraft accident with no resulting release of the radioactive material. Persons or animals that have been injected with or ingested radioactive materials will emit insignificant amounts of radioactivity.

In an effort to further establish effective procedures for monitoring and enforcing its regulations for transportation of radioactive material, the FAA has adopted a regulation which establishes inspection requirements and radiation monitoring. The regulation requires inspection of packages carrying any dangerous article including radioactive material to determine whether, in all outward respects, it complies with the packaging, marking, and labeling requirements of the regulations. Radioactive materials will be scanned with a monitoring device to determine if the radiation levels on the surface and the transport index are within the limits permissible for transportation by air. The package will be scanned after it is unloaded and the aircraft compartment will be scanned when it is determined that there has been a leakage of radioactive materials or that the appropriate levels of radiation are exceeded by the package. (40 Federal Register 5140, February 4, 1975.)

IV. Alternatives.

1. Exclusion of all radioactive materials from passenger-carrying aircraft.

This would effectively deprive many hospitals, clinics, physicians, and patients of the use of radiopharmaceuticals necessary for research, diagnosis and treatment of diseases. The short half-life of these materials and the relatively small number of airports served by cargo-only aircraft would make other means of transportation unacceptable to meet the need. Properly packaged, these materials do not present an unreasonable risk during air transportation. This alternative is clearly contrary to the intent of Congress in P.L. 93-633.

2. Do not grant an exemption for the small quantities identified in 49 CFR 173.391 or grant exemption on an item-by-item basis.

This would require screening of all passengers and baggage for watches with luminous dials, cameras, and other common products possibly containing radioactive materials even though the quantity of such material has led to the determination that the product, or material in its raw state, properly packaged for normal transportation, does not constitute a significant hazard. To question the hazard of these materials would question the hazard of all the products now exempt in all modes of transportation and possibly their use by the public. The impracticality of an item-by-item

reanalysis of all the exempt materials, products and devices within Section 173.391 militates in favor of all or nothing treatment. In view of both the longstanding practice with regard to such small quantities and the absence of evidence that exemption of these quantities is contrary to the public interest this alternative is rejected.

It should be noted that in accordance with the terms of Section 107 of P. L. 93-633 the exemption for small quantities shall not exceed two years. In that period, any information that bears upon the level of safety in connection with the transportation of any exempt material or product or device containing an exempt quantity will be considered by the agency.

V. Conclusion.

After review of the proposed notice of proposed rule making, we conclude that the proposed rule and exemptions thereto, in accordance with Sections 107 and 108 of P. L. 93-633 are in the public interest, are adequate to protect the public against the risks to life and property, and will have no significant impact upon the human environment.

APPROVED:

Chief, Regulations Staff

Feb 26, 1975
Date

Director, Flight Standards Service

Feb 26, 1975
Date

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1975, will be considered before action is taken on the proposed amendment. No public hearing is contemplated at this time, but arrangements for informal conferences with Federal Aviation Administration officials may be made by contacting the Chief, Airspace and Procedures Branch. Any data, views or arguments presented during such conferences must also be submitted in writing in accordance with this notice in order to become part of the record for consideration. The proposal contained in this notice may be changed in the light of comments received.

The official docket will be available for examination by interested persons at the Office of the Regional Counsel, Southwest Region, Federal Aviation Administration, Fort Worth, Texas. An informal docket will also be available for examination at the Office of the Chief, Airspace and Procedures Branch, Air Traffic Division.

It is proposed to amend Part 71 of the Federal aviation regulations as hereinafter set forth.

In § 71.181 (40 FR 441), the following transition area is added:

OZARK, ARK.

That airspace extending upward from 700 feet above the surface within a 9-statute-mile radius of Ozark-Franklin County Airport, Ozark, Ark., latitude 35°20'36" N., longitude 93°50'23" W.

The proposed transition area will provide controlled airspace for aircraft executing approach/departure procedures proposed at the Ozark-Franklin County Airport, Ozark, Ark.

Concurrently with this action, the Ozark-Franklin County Airport will be changed from VFR to IFR status.

(Sec. 307(a), Federal Aviation Act of 1958 (49 U.S.C. 1348); Sec. 6(c), Department of Transportation Act (49 U.S.C. 1655(c)))

Issued in Fort Worth, Texas, on January 24, 1975.

ALBERT H. THURBURN,
Acting Director,
Southwest Region.

[FR Doc.75-3100 Filed 2-3-75;8:45 am]

[14 CFR Part 103]

[Docket No. 14219; Notice No. 75-2]

CARRIAGE OF RADIOACTIVE MATERIALS

Proposed Rule Making

The Federal Aviation Administration is considering amending Part 103 of the Federal Aviation Regulations to limit the carriage of radioactive materials on passenger-carrying aircraft to those intended for use in, or incident to, research or medical diagnosis or treatment and to those shipments of radioactive materials that meet requirements in 49 CFR 172 and 173 which exempt them from packaging, marking and labeling requirements for shipment by rail express and which are now exempt from the applicability of Part 103. The proposed amendments would implement section 108 of the Transportation Safety Act of 1974 (Pub. L. 93-633) in the light of views presented by interested persons at a public hearing held by the FAA on January 20, 1975 (40 FR 2607).

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket, AGC-24, 800 Independence Avenue, S.W., Washington, D.C. 20591. All communications received on or before March 10, 1975, will be considered by the Administrator before taking action on the proposed rule. The proposals contained in this notice may be changed in the light of comments received. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. In view of the statutory requirement for completion of this rule-making action, as explained hereinafter, no extensions of the date specified for filing comments will be entertained. Interested persons who wish to submit comments are urged to do so promptly.

Section 108 of the Transportation Safety Act of 1974, enacted into law on January 3, 1975, directs the Secretary of Transportation to issue regulations within 120 days after the date of enactment, in accordance with section 103 and pursuant to section 105 of that Act, with respect to the transportation of radioactive materials on any passenger-carrying aircraft in air commerce. The pertinent provision of section 108 of the Act states in part:

Sec. 108(a) General—* * * Such regulations shall prohibit any transportation of radioactive materials on any such aircraft unless the radioactive materials involved are intended for use in, or incident to, research or medical diagnosis or treatment, so long as such materials as prepared for and during transportation do not pose an unreasonable hazard to health and safety. The Secretary shall further establish effective procedures for monitoring and enforcing the provisions of such regulations.

(b) Definition—As used in this section, "radioactive materials" means any materials or combination of materials which spontaneously emit ionizing radiation. The term does not include materials in which (1) the estimated specific activity is not greater than 0.002 microcuries per gram of material, and (2) the radiation is distributed in an essentially uniform manner.

To implement section 108 of the Act, it is proposed to amend § 103.1 and include for the purpose of Part 103 a definition of the term "radioactive materials", that conforms to the definition of the term in section 108(b) of the Act. The proposal would also add to § 103.1 a definition of the term "research," as used in section 108(a) of the Act, since it is not defined in the Act. In addition, this proposal would amend § 103.7 to restrict the carriage of radioactive materials on passenger-carrying aircraft to those materials involved for use in, or incident to, research, or medical diagnosis or treatment and those exempted by § 103.1(e) from the requirements of Part 103.

The legislative history of the Act indicates that it was not the intent of Congress to prohibit the carriage of tiny trace elements or small quantities of radioactive material on passenger-carrying aircraft, notwithstanding the literal wording of section 108 of the Act (Congressional Record of December 19, 1974, Volume 120, Number 170, [illegible]). Accordingly, this proposal would amend § 103.1(e) and exclude from the applicability of Part 103 human beings and animals with an implanted medical device, such as a heart pacemaker, that contains radioactive material or with radiopharmaceuticals that have been injected or ingested. The FAA believes these devices and materials used for medical purposes do not pose an unreasonable hazard to health and safety aboard passenger-carrying aircraft.

In addition, in light of the legislative history of the Act, it is proposed to amend § 103.1(e) and exempt from the applicability of Part 103 small quantities of radioactive materials that meet those requirements in 49 CFR Parts 172 and 173 in effect on the issuance date of this Notice that exempt them from the packaging, marking and labeling requirements for shipment by rail express. These materials, which have been exempted under the regulations of 49 CFR Parts 172 and 173 for more than 20 years, are currently excluded from the applicability of Part 103 and this proposal would continue to exclude them under the exemption authority of section 107 (a) of the Act for a period of two years. The two year period is necessary, since such a limitation is required by the exemption authority of section 107(a) of the Act, but that authority permits exemptions to be renewed.

Included in this category of exempted materials are devices such as luminous clocks and watches, aircraft dials, electron tubes, and exit markers. Also included are calibration sources that are component parts of radiation survey instruments routinely used by personnel of shippers, carriers, and regulatory agencies to monitor shipments for compliance with applicable regulations, as well as schedule quantities of materials not contained in any devices. The maximum allowable radiation level at the surface for any package of such exempted materials is 0.5 millirem per hour and in the event any material were lost from any package it would not pose any hazard to health and safety. Accordingly, the FAA considers the continued exemption of these materials to be safe and consistent with the public interest and the policy of the Hazardous Materials Transportation Act.

This proposal would also amend § 103.3 to prohibit a shipper from offering, and an aircraft operator from accepting, radioactive materials subject to Part 103 for shipment in a passenger-carrying aircraft, unless there is accompanying the shipment a clear and visible statement, in addition to that required by

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DEPARTMENT OF TRANSPORTATION

Coast Guard

[CGD 75-007]

PROPOSED REPLACEMENT OF DUMBARTON HIGHWAY BRIDGE (ROUTE 84)

Postponement of Public Hearing

Proposed replacement of Dumbarton Highway Bridge (Route 84) across south part of San Francisco Bay, mile 22.0 navigation requirements and draft environmental impact statement.

Notice is hereby given that the public hearing notice of which was published in the FEDERAL REGISTER Wednesday, January 15, 1975 (40 FR 2740) is postponed from 8 p.m., Monday, February 24, 1975 to 8 p.m., Wednesday, February 19, 1975.

R. L. PRICE,
Rear Admiral, U.S. Coast Guard, Chief, Office of Marine Environment and Systems.

JANUARY 29, 1975.

[FR Doc.75-3131 Filed 2-3-75;8:45 am]

[CGD 75-029]

U.S. SOLAS SUBCOMMITTEE WORKING GROUP ON RADIOCOMMUNICATIONS

Open Meeting

This is to give notice in accordance with section 10(a) of the Federal Advisory Committee Act (Pub. L. 92-463; 5 U.S.C. App. I) of October 6, 1972 that the U.S. Solas Subcommittee Working Group on Radiocommunications will conduct an open meeting on Thursday, 20 February 1975, in Room 817 of the Federal Communications Commission, 1919 M. Street, NW, Washington, D.C. The meeting is scheduled to begin at 1:30 p.m.

The purpose of the meeting is to discuss the agenda for the Radiocommunications Subcommittee of the Intergovernmental Maritime Consultative Organization (IMCO).

The Safety of Life at Sea Subcommittee was established by the Department of State to provide advice, from the best information available towards improvement of safety of life at sea. In addition the Subcommittee may consider any matters which may be put forward by the International Conference on Safety of Life at Sea, by the IMCO Assembly, Council or Maritime Safety Committee, or which may originate within the SOLAS Subcommittee itself.

Public members of the Subcommittee serve voluntarily without compensation from the Federal Government, either travel or per diem.

Interested persons may seek additional information by writing:

Capt. W. T. Adams
Chief, Telecommunications Management Division
U.S. Coast Guard (G-OTM/74)
Washington, D.C. 20590

or by calling (202) 426 1345.

Dated: January 30, 1975.

J. A. PALMER,
Rear Admiral, U.S. Coast Guard, Chief, Office of Public and International Affairs.

[FR Doc.75-3130 Filed 2-3-75;8:45 am]

Federal Aviation Administration

[Docket No. 14243]

CARRIAGE OF RADIOACTIVE MATERIALS

Public Hearing

The Federal Aviation Administration will hold a public hearing in order to receive the views of all interested persons regarding proposed amendments to Part 103 of the Federal Aviation Regulations which would implement section 108 of the Transportation Safety Act of 1974 (Pub. L. 93-633). These proposals are set forth in Notice of Proposed Rule Making No. 75-2, which is published elsewhere in this issue of the FEDERAL REGISTER. The hearing will be conducted on Thursday, February 27, 1975, at 9:30 a.m. at the Federal Aviation Administration, Auditorium—3rd Floor, 800 Independence Avenue, SW, Washington, D.C. 20591.

Section 108 of the new Transportation Safety Act of 1974, enacted into law on January 3, 1975, directs the Secretary of Transportation to issue regulations limiting the carriage of radioactive materials on passenger-carrying aircraft within 120 days after the date of enactment, in accordance with section 108 and pursuant to section 105 of the Act, including an opportunity for informal oral presentation. Pursuant to the authority delegated to the Administrator by the Secretary, the FAA has issued Notice 75-2 and will hold a public hearing in order to afford interested persons an opportunity for informal oral presentation regarding the proposals set forth in Notice 75-2.

The hearing will be an informal hearing conducted by a designated representative of the Administrator under 14 CFR 11.33. It will not be a judicial or evidentiary type hearing, so there will be no cross-examination of those persons presenting statements (5 U.S.C. Sec. 556).

An FAA spokesman will make an opening statement discussing, in brief, the proposals made in Notice 75-2. Interested persons will then be given an opportunity to present their oral statements. These statements should be responsive to Notice 75-2.

After all initial statements have been completed, those persons who wish to make rebuttal statements will be given an opportunity to do so in the same order in which they made their initial statements.

Interested persons are invited to attend the hearing and present oral or written statements on the proposals set forth in Notice 75-2. Such statements will be made a part of the record of the hearing. Any person who wishes to make an oral statement at the hearing should notify the FAA prior to the date of hearing, stating the amount of time requested for his initial statement. Written comments and all other communications concerning the hearing should be addressed to Office of the Chief Counsel, Rules Docket, AGC-24, Federal Aviation Administration, Department of Transportation, 800 Independence Avenue SW., Washington, D.C. 20591, marked "Attention" Presiding Officer, Public Hearing on Notice 75-2."

Notice 75-2, is published in this issue of the FEDERAL REGISTER and proposes amendments to Part 103 to implement section 108 of the Transportation Safety Act of 1974 by limiting the carriage of radioactive materials on passenger-carrying aircraft to those shipments intended for use in, or incident to, research or medical diagnosis or treatment and to those that meet the requirements of 49 CFR 172 and 173 which exempt them from the packaging, marking and labeling requirements for shipment by rail express and which are now exempt from the applicability of Part 103 of the Federal Aviation Regulations.

The FAA will carefully consider all statements presented at the hearing and relevant written comments received and made a part of the record and all other comments received in response to Notice 75-2. After consideration of all these statements and comments, the FAA will issue an appropriate amendment.

A transcript of the hearing will be made and anyone may purchase a copy of it from the reporter.

(Secs. 313(a) and 601 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a) and 1421) and secs. 105, 107 and 108 of Pub. L. 93-633 as delegated to the Administrator by the Secretary of Transportation (40 FR 22931))

Issued in Washington, D.C., on January 29, 1975.

R. P. SKULLY,
Director,
Flight Standards Service.

[FR Doc.75-3137 Filed 2-3-75;8:45 am]

Federal Railroad Administration

[FRA Waiver Petition No. HS-75-3]

MASSENA TERMINAL RAILROAD CO.

Petition for Exemption From Hours of Service Act

The Massena Terminal Railroad Company has petitioned the Federal Railroad Administration pursuant to 45 U.S.C. 64a(e) for an exemption, with respect to certain employees, from the Hours of Service Act, 45 U.S.C. sections 61, 62, 63 and 64.

Interested persons are invited to participate in this proceeding by submitting written data, views, or comments. Communications should be submitted in triplicate to the Docket Clerk, Office of Chief Counsel, Federal Railroad Administration. Attention: FRA Waiver Petition No. HS-75-3, Room 5101, 400 Seventh Street, SW., Washington, D.C. 20590. Communications received before March 5, 1975, will be considered before final action is taken on this petition. All comments received will be available for examination by interested persons during business hours in Room 5101, Nassif Building, 400 Seventh Street, SW, Washington, D.C. 20590.

Issued in Washington, D.C. on January 29, 1975.

DONALD W. BENNETT,
Chief Counsel,
Federal Railroad Administration.

[FR Doc.75-3115 Filed 2-3-75;8:45 am]

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current § 103.3(a), that the shipment contains radioactive materials intended for use in, or incident to, research, or medical diagnosis or treatment and meets the requirements of Part 107 for shipment in passenger-carrying aircraft.

The FAA believes the present provisions of Part 103 are adequate to ensure that radioactive materials authorized for carriage aboard passenger-carrying aircraft by section 831(a) of the Act will not, when so carried, pose an unreasonable hazard to health and safety. However, it should be noted that in 1973 the FAA suspended the effectiveness of that part of Amendment 103-17 governing the distribution of packages of radioactive materials aboard aircraft to permit the completion of studies then being conducted. The FAA stated that it would, thereafter, take whatever rule-making action it deemed appropriate. Studies and surveys conducted by the United States Atomic Energy Commission (AEC), in cooperation with the Department of Transportation, Office of Hazardous Materials, and the FAA to evaluate the adequacy and effectiveness of the present regulations of Part 103 for the transportation of radioactive materials by air have been completed and the AEC has issued a report based thereon. The FAA is currently developing a notice of proposed rule making based upon those studies and surveys conducted, including the AEC report.

These amendments are proposed under the authority of sections 313(a) and 601 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a) and 1421), and sections 105, 107, and 108 of Pub. L. 93-633, as delegated to the Administrator by the Secretary of Transportation (40 FR 2561).

In consideration of the foregoing, it is proposed to amend Part 103 of the Federal Aviation Regulations as follows:

1. By amending § 103.1(c) by revising subparagraph (4) and adding a new subparagraph (6) to read as follows:

§ 103.1 Applicability.

* * * * *

(c) This part does not apply to— * * *

(4) Prior to (2 years after effective date of amendment) radioactive materials that meet those requirements in 49 CFR Parts 172 and 173 in effect on (issuance date of this notice) that exempt them from the packaging, marketing, and labeling requirements for shipment by rail express.

* * * * *

(6) Human beings and animals with an implanted medical device, such as a heart pacemaker, that contains radioactive material or with radio pharmaceuticals that have been injected or ingested.

2. By amending § 103.1 by adding a new paragraph (d) to read as follows:

§ 103.1 Applicability.

* * * * *

(d) For the purposes of this part—

(1) Radioactive materials means any materials or combinations of materials which spontaneously emit ionizing radiation. The term does not include materials in which (i) the estimated specific activity is not greater than 0.002 microcuries per gram of material; and (ii) the radiation is distributed in an essentially uniform manner.

(2) Research means investigation or experimentation aimed at the discovery and interpretation of facts or revision of accepted theories or laws in the light of new facts.

3. By amending § 103.3 by adding a new paragraph (d) to read as follows:

§ 103.3 Certification requirements.

* * * * *

(d) In addition to the requirements of paragraph (a) of this section, no shipper may offer, and no person operating an aircraft may knowingly accept, any radioactive materials subject to the requirements of this part for shipment in a passenger-carrying aircraft unless there is accompanying the shipment a clear and visible statement that the shipment contains radioactive materials intended for use in, or incident to, research, or medical diagnosis or treatment and meets the requirements of this part for shipment in passenger-carrying aircraft.

4. By amending § 103.7 by revising paragraph (b)(6) to read as follows:

§ 103.7 Passenger-carrying aircraft.

No person may carry any dangerous article in a passenger-carrying aircraft except—

* * * * *

(b) The following articles when packaged, marked, and labeled as specifically provided in 49 CFR Parts 171 through 173 for shipment by rail express:

* * * * *

(6) Subject to applicable provisions of this Part, radioactive materials intended for use in, or incident to, research, or medical diagnosis or treatment and those radioactive materials that are exempted by § 102.1(c) (4) and (5) from the requirements of this part.

Issued in Washington, D.C., on January 29, 1975.

R. P. SKULLY,
Director,
Flight Standards Service.

[FR Doc.75-3156 Filed 2-3-75;8:45 am]

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 85]

[FRL 323-8]

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Extension of Comment Period for Proposed Selective Enforcement Auditing Procedures

The Environmental Protection Agency published a notice of proposed rulemaking, 39 FR 45360, dated Tuesday, December 31, 1974, for Selective Enforcement Auditing of new motor vehicles. In order to afford interested persons an opportunity to participate in the rulemaking proceeding the notice invited written submissions of data, views, or arguments relative to the proposed regulation. The closing date for comments was set for March 3, 1975. Submissions to the docket by the Motor Vehicle Manufacturers Association and Ford Motor Company indicate that the March 3, 1975, closing date does not allow adequate time for participants to fully respond to the solicitation of data, views, or arguments, and request that the comment period be extended.

The Agency has considered these requests and has concluded that an extension of the comment period is warranted. Accordingly, the closing date is hereby extended to April 17, 1975, and all comments received on or before that date will be considered. Interested persons may participate in this rulemaking proceeding by submitting written comments (ten (10) copies) to Director, Mobile Source Enforcement Division (EC-340), room 3220 WSM, Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460. All comments will be available for public inspection during normal working hours at the Freedom of Information Office, room 232 WSM, 410 M Street, SW., Washington, D.C. 20460.

Dated: January 29, 1975.

ALAN G. KIRK II,
Assistant Administrator for Enforcement and General Counsel.

[FR Doc.75-3085 Filed 2-3-75;8:45 am]

SECURITIES AND EXCHANGE COMMISSION

[17 CFR Part 240]

[Release No. 34-11217; S7-545]

TRANSACTIONS IN GOLD

Proposed Financial Responsibility Requirements for Broker-Dealers, Extension of Comment Period

The Securities and Exchange Commission today announced an extension until February 5, 1975 of the comment period on proposed Rule 15c3-3 as announced in Securities Exchange Act Release No. 11133 (40 FR 1520). The Commission has received several requests from self-regulatory organizations and others for an extension of time in which to comment on the proposed rule in order that such organizations may complete analysis of the proposed rule.

Comments should be addressed to George A. Fitzsimmons, Secretary, Securities and Exchange Commission, 500 North Capitol Street, Washington, D.C. 20549. All such communications should bear the File No. S7-545 and will be available for public inspection.

[SEAL] GEORGE A. FITZSIMMONS,
Secretary.

JANUARY 29, 1975.

[FR Doc.75-3311 Filed 2-3-75;8:45 am]

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 2 8 1975

Mr. John F. Shea, III
Assistant Attorney General
State of New York
Two World Trade Center
New York, New York 10047

Dear Mr. Shea:

I am pleased to respond to your letter of March 28, 1975 addressed to Dr. Dixy Lee Ray concerning the transportation of nuclear materials via air in the New York City Metropolitan Region.

The Commission has stated that, pending the completion of the presently active review of the regulations and the procedures which should be followed by NRC and other Government agencies regarding the licensing of exports, the Commissioners will review all export and import license applications involving significant quantities of special nuclear material. In addition, the Commissioners expect to review any NRC licensee shipments by air of significant quantities of plutonium, scheduled to be imported or exported under existing licenses. There are no such licensee shipments of significant quantities of plutonium scheduled to come into or go out of J. F. Kennedy Airport.

Neither this Commission nor the Atomic Energy Commission prepared an environmental impact statement assessing the effects and impact of promulgation and implementation of the Commission's rules regarding the export or import by air and related transport of nuclear materials either through the New York Metropolitan region or through the United States and its territories. Each individual domestic shipment or import shipment of radioactive material, which, in the case of special nuclear material and significant quantities of other radioactive material, number in the thousands, is not, generally speaking, the subject of an environmental impact statement under the National Environmental Policy Act of 1969. However, the Commission would prepare an impact statement if it determined that issuance of a license or license amendment involving an individual shipment was a major action significantly affecting the



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quality of the human environment. This is in accord with the NRC regulation implementing NEPA, 10 CFR Part 51, a regulation promulgated by the Atomic Energy Commission prior to enactment of the Energy Reorganization Act of 1974 in conformance with guidelines established by the Council on Environmental Quality.

Commission and DOT regulations pertaining to transportation of radioactive materials specify safety standards for packages used in transportation of radioactive materials and do not distinguish among the different modes of transportation. These standards which packages must meet are based on two main considerations: (1) protection of the public from external radiation, and (2) assurance that the contents either are unlikely to be released during either normal or accident conditions of transport or, if the container is not designed to withstand accidents, that its contents are so limited in quantity as to preclude a significant radiation safety problem if released. With respect to air shipments, it was considered that taking into account the high integrity packaging required, and the low accident probability for air transportation (no more than one accident of any type per 100 million miles) the risk of an air accident resulting in a release of radioactive material from a package was very small.

No environmental impact statements were prepared by the AEC on amendments of the regulations applicable to the transportation of nuclear materials (10 CFR Parts 20, 71 and 73). However, environmental impact appraisals have been prepared in connection with certain amendments to 10 CFR Part 71 relating to form for shipping plutonium, amendments to 10 CFR Part 20 relating to procedures for picking up, receiving, and opening packages, amendments to Part 73 relating to safeguarding of certain special nuclear material, and in connection with proposed amendments to Part 73 which would require an increased level of physical protection for shipments of strategic quantities of special nuclear material. Copies of the environmental impact appraisals are enclosed.

The Commission intends to conduct a rule making proceeding that will cover transportation of special nuclear material, including plutonium, by air. This proceeding will, of course, afford opportunity for public participation. An environmental impact statement will be prepared in connection with this rule making proceeding.

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Although all NRC regulations are presently under review, the NRC has not yet proposed or adopted any new regulations pertaining to air transportation other than a proposed amendment to Part 73 that would require advance notice of shipments of strategic quantities of special nuclear material, published April 4, 1975, which solicited public comment. The Atomic Energy Commission solicited public comment in virtually all of its rule making proceedings relating to transportation, through publication of a notice of proposed rule making in the Federal Register in compliance with section 4 of the Administrative Procedure Act. A list indicating dates of publication and Federal Register volume and pages is enclosed.

The Commission is, of course, concerned that the public health and safety and the common defense and security are adequately protected in the activities subject to its jurisdiction, and intends that every effort be made, as the agency responsible for regulation of nuclear energy and materials, in that regard.

Sincerely,

Lee V. Gossick
Executive Director
for Operations

Enclosures:
As stated

SPECIAL SAFEGUARDS STUDY

Dr. David M. Rosenbaum

Dr. John N. Googin

Mr. Robert M. Jefferson

Dr. Daniel J. Kleitman

Mr. William C. Sullivan

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INTRODUCTION

This document is the result of a short intensive look at safeguards problems by five knowledgeable people who have no vested interest in the system as it now operates. Our mandate was "to say what ought to be done." We restricted our attention to the unauthorized acquisition of special nuclear materials in quantities necessary for the manufacture of nuclear explosives. Because of the short time allowed, we have taken a very broad brush view of the problem. A considerably longer study might, of course, lead us to modify some of our conclusions; but we doubt very much that we would change them in any fundamental way, regardless of the time and depth allowed. Readers of this paper may be interested in the classified paper, Diversion Scenarios, written by the same authors, which contains some examples of ways in which special nuclear material might be diverted under present regulations.

In recent years the factors which make safeguards a real, imminent and vital issue have changed rapidly for the worse. Terrorists groups have increased their professional skills, intelligence networks, finances, and levels of armaments throughout the world. International terrorist organizations, particularly those of the Arabs, probably have the ability to infiltrate highly trained teams of 10 to 15 men into this country without detection. In addition, a number of groups in Latin America have graphically

shown the ability of urban terrorist groups to operate with near impunity for long periods of time. These groups are quite different in character from those more traditional rural movements which operate in close conjunction with the peasantry. Urban groups are normally led and largely staffed by upper middle class members of the establishment who hold, or have held, important jobs in the community. Such groups can have an enormous impact on a society even when they lack the strength to take power themselves.

Even though safeguard regulations have just been revised, two factors have appeared in recent months which make necessary a new and fundamental look at the problem. The first of these is the widespread and increasing dissemination of precise and accurate instructions on how to make a nuclear weapon in your basement. While such information may have always been available in the unclassified literature it was masked by a great deal of irrelevant and incorrect information, also readily available. There is a slow but continuing movement of personnel into and out of the areas of weapons design and manufacturing. These moves are sometimes forced and can create very strong resentments in the people involved. As a result, larger and larger numbers of people with experience in processing special nuclear materials and with varying psychological attitudes are dispersed in the overall industrial community. In addition, the psychological effect on terrorist groups of widespread dissemination of such information should not be overlooked.

The second new factor is the recent start of political kidnappings within the United States. It is our opinion that the kidnapping of Patricia Hearst does not represent an isolated and passing incident, but is rather the precursor of a wave of such incidents. If not firmly and competently met, these kidnappings may lead to a rise of urban terrorist groups in this country of a sort without precedent in our history. These groups are likely to have available to them the sort of technical knowledge needed to use the now widely disseminated instructions for processing fissile materials and for building a nuclear weapon. They are also liable to be able to carry out reasonably sophisticated attacks on installations and transportation. We believe these new factors necessitate an immediate and far reaching change in the way we conduct our safeguards programs.

THE ESSENCE OF THE PROBLEM

The potential harm to the public from the explosion of an illicitly made nuclear weapon is greater than that from any plausible power plant accident, including one which involves a core meltdown and subsequent breach of containment. Because of the widespread dissemination of instructions for processing special nuclear materials and for making simple nuclear weapons, acquisition of special nuclear material remains the only substantial problem facing groups which desire to have such weapons.

Not only do illicit nuclear weapons present a greater potential public hazard than the radiological dangers associated with power plant accidents, but the factors involved in preventing their potential manufacture have received a great deal less attention and consequently the relevant regulations are much less stringent. It is our strong feeling that the point of view adopted, the amount of effort expended, and the level of safety achieved in keeping special nuclear material out of the hands of unauthorized people is entirely out of proportion to the danger to the public involved and to the point of view, effort, and safety achieved in radiological matters, particularly those associated with power plants.

We believe that it is necessary to adopt the same framework for safeguards protection as is normally used in examining the safety of power plants and to apply it with the same rigor and depth. In particular, the threat and the systems designed to meet that threat, should

be viewed in terms of design basis incidents. We need to design safeguard systems to assure that no single failure of an active or passive feature of any system will lead to the inability of that system to perform its function. Only by viewing the problem in this framework can we take realistic and adequate steps to meet it.

The seriousness of the problem demands a clear commitment by the AEC to bring the risk to the public from safeguards problems down to the level of public risk associated with the operation of nuclear power plants.

THE THREAT

Our estimate of the maximum credible threat to any facility or element of transportation handling special nuclear materials is fifteen highly trained men, no more than three of which work within the facility or transportation company from which the material is to be taken. We believe that the "insiders" can include anyone up to the highest levels of management of the organization involved. This threat estimate is by nature both subjective and imprecise, but we believe it to be informed and conservative. It was arrived at after informal discussions with the FBI and CIA, and based on those discussions and on prior relevant experiences of the members of this study.

While any estimate of a maximum credible threat will be subjective and uncertain, we recommend that the AEC periodically ask the FBI and the CIA for formal written estimates of the maximum credible threat from both domestic and foreign groups. We do not believe that there is any need for the AEC to fund any group outside the government to make a study to determine the threat, as such a group is unlikely to have the capabilities and experience in this area which reside in the FBI and the CIA and, in any case, would have to get most of their current information from those two agencies.

We have not made any attempt to discuss the threat imposed by particular groups, although we considered many such groups in making our estimate.

because we feel that what is at issue in this paper is the level and the nature of the threats involved rather than the particular organizations which might carry out those threats.

DIVERSION SCENARIOS

A wide range of scenarios was considered by the group. They included those presented by Theodore B. Taylor in the December 1973 articles in the "New Yorker" and his testimony before congressional committees, those suggested during extensive conversations with the technical and management staffs of organizations actively involved in the production of fuel elements, and those known to the members of the group from their own extensive involvement with security problems. The set of scenarios was certainly not complete, but it represented the types that we felt should be used as the basis for developing an effective safeguards system. Some of these scenarios are given in the classified paper, "Diversion Scenarios", by the same authors.

RECOMMENDATIONS

THE FUNDAMENTAL RECOMMENDATION

By far the most important recommendation we have to make concerns the structure within which safeguards problems are viewed. Once the Commission adopts the same framework for safeguards safety as is normally used in examining the safety of power plants, and applies it with the same rigor and depth, the public hazard associated with the unauthorized acquisition and utilization of special nuclear materials will be quickly brought to the level of the hazard associated with nuclear power plant accidents. At present we believe safeguards hazards to be many times greater.

RECOMMENDATION:

We recommend that the threat represented by unauthorized acquisition of special nuclear materials and the adequacy of systems to meet that threat, should be viewed in terms of design basis incidents. Safeguard systems should be designed to assure that no single failure of an active or passive feature of a system will lead to the inability of that system to perform its function. The regulations and the level of review should be sufficient to reduce the hazard to the public from unauthorized acquisition of special nuclear materials to the same level as that from nuclear power plants.

In order to carry out this recommendation the budget allowed for safeguard reviews and the number and qualifications of the people concerned with safeguards will have to be substantially increased.

FEDERAL PROTECTION OF SPECIAL NUCLEAR MATERIALS

Protection of the common defense and security against significant armed attack is not a responsibility which it is reasonable or equitable to assign to private industry. Private companies have neither the capability nor the desire to meet the sort of threats described in our document on diversion scenarios, much less those posed by the maximum credible threats. There is also a substantial question as to when private guards can legally use their weapons. We were told by one transportation company that it had written to the Attorneys General of the 48 contiguous states asking whether their uniformed guards can carry arms across the state border. They were informed in every case that they could not do so without a license. The company does not plan to license its guards to carry guns in any except its home state even though, because of AEC requirements, its guards will carry weapons across the country and will be instructed to do what is necessary to protect the SNM. Other companies have instructed their guards not to use their weapons to stop theft of special nuclear material, but only in defense of their lives. It seems to us that the present system of protecting facilities and transportation which handle special nuclear materials is inadequate.

There are a number of other physical security problems that should be handled directly by the Federal government. An example of the sort of thing we have in mind is a Federal organization that would:

a. Carry and protect all shipments of significant quantities of licensed special nuclear material.

b. Approve (in addition to the regular licensing approval) the physical protection plans for fixed sites handling significant quantities of special nuclear material.

c. Provide the armed guards for fixed sites handling significant quantities of special nuclear material.

d. Make prior standing arrangements to get an adequate response team (not necessarily of its own personnel) to the site of any attempted diversion in a timely manner. Sometimes this might involve a response by air as well as by road. In open areas, for example, it is vital that escape by air as well as by surface vehicle can be monitored and interdicted. Depending on the locality this might involve fighter planes, radar equipped search planes, and/or helicopters. Where necessary, prior arrangements will need to be made with the Department of Defense for emergency assistance.

e. Include a Special Response Force which would respond to incidents of diversion with special equipment and trained personnel, much as the Joint Nuclear Accident Coordinating Center teams respond to weapons accidents. The Special Response Force would also have the responsibility to contact and coordinate any other federal, state and local agencies needed.

RECOMMENDATION:

In order to limit the responsibility of licensees for the national defense and in order to insure a properly graded capability against the diversion of special nuclear material, we recommend the establishment of a federal nuclear protection and transportation service. We further recommend that all protection functions which could require the use of force be direct federal responsibilities. There are many possible ways to do this and the alternatives ought to be studied in a systematic and careful way, but an upgraded system ought to be adopted immediately as a temporary measure. If a small federal force is formed now it will help to meet the present pressing need and can be enlarged and improved as the need grows.

THE NEED FOR BETTER INTELLIGENCE

The first and one of the most important lines of defense, against groups which might attempt to illegally acquire special nuclear materials to make a weapon, is timely and in-depth intelligence. Such intelligence may involve electronic and other means of surveillance, but its most important aspect is infiltration of the groups themselves. It is not the AEC's business to conduct this sort of intelligence, but it is the AEC's business to see that those agencies of the United States Government which have intelligence gathering responsibilities including the FBI, CIA, and NSA, focus their attention upon this particular threat to our national defense and security. While it is true that if they came upon any such information in the course of their general intelligence duties they would communicate it to someone in the Atomic Energy Commission, unless they are frequently prodded they will not focus more than pro forma attention on safeguards problems and their resources will be invested elsewhere in response to other pressures.

RECOMMENDATION:

The AEC should establish a continual and strong liaison with the CIA, FBI, and other appropriate agencies, and should exert every effort to see that these agencies expend a level of resources on safeguards problems commensurate with the importance of the issue.

DYNAMIC TESTING

RECOMMENDATION:

In addition to conventional compliance inspections to determine adherence to regulations, a dynamic testing system should be devised to provide a realistic examination of the overall safeguards afforded SNM by each licensee. We suggest the use of gaming analysis, including "blackhat teams" such as those used by Sandia Labs, to study sabotage and diversions involving weapons. Licensing should use the existing capability of AEC contractors to perform theoretical "blackhat" studies of fixed facilities and transportation. These studies should develop threat scenarios and detect systems weaknesses so that safeguards can be evaluated on a more realistic basis than that which can be accomplished by inspecting only for compliance with regulations. The resulting threat scenarios could form the basis for a simulated but dynamic testing of a licensee's SNM safeguards, and the modification of regulations to close loopholes.

ACCOUNTABILITY: DISCUSSION

The strong emphasis on material balance techniques for the control of special nuclear material has roots going back to the early days of the Manhattan Project. The extremely high unit values of the first materials produced made process control of manufacturing at the high level of analytical laboratories easily justifiable on economic as well as strategic grounds. Even in these early days, the percent of uncertainty was of the same magnitude as can be obtained at the present; but because of low throughput and inventories, the actual quantities of materials involved in the uncertainties were in fact very small.

The feeling that material balance techniques can yield uncertainties in the weight quantities of SNM on hand comparable to the early days still persists despite the fact that it is really the percent inaccuracy that is unchanged. This percent of uncertainty applied to present and projected inventories and throughputs makes the use of the inventory and material balance much too gross a technique for detection of diversions which are large enough to be of critical importance. The uncertainties in the accumulated material balances of the atomic energy operation of the country already make it impossible to say that an explosive mass has not been diverted, and if reliance is placed solely on material balance methods that statement will have to be expanded many many fold in the near future. The current use of these techniques is probably not worth their cost.

Material balance techniques do have positive value: they are essential to process control and their existence has great deterent value for those who are unaware of its limitations.

Although inaccuracies of measurement will lead to total LEMUF's above critical masses this is not to say that the measurement techniques and concepts of current regulations and similar existing technology could not be used to detect diversion. In fact we believe the opposite: one can do something about safeguards by the use of accounting and measurement, but this will require a new approach to the subject. It will be necessary to direct the accountability effort not toward computing an overall balance as it now is, but toward detection of diversion.

There are some significant obstacles in the use of accountability for safeguards. A serious problem with inventory and material balance control systems is the ease with which they can be confused by bad data. Just the normal errors of transposed figures and misread instruments are a continuing problem, and the confusion which can be introduced by a person skilled in the analytical arts and the physics and chemistry of a process is frightening. The standard samples to labs can be altered to force a bias on the whole process. Interfering materials can be added to samples and process lines. Instruments can be made to give erroneous results. The very complexity of the process invites tampering of a kind which defies detection.

Another serious problem with using MUF's and LEMUF's as a safeguard is that there is no reasonable procedure for going from an observed MUF to a conclusion that a theft has occured. Current procedure involves rechecking measurements, performing a new inventory, waiting for an error to be found, and then cleaning equipment to recover material not inventoried.

Perhaps the greatest problem with the present inventory and material balance control system is the lack of timeliness of the data. For large plants the best that is done is to give results every month. In cases where there are problems in closing a blance, it is often weeks more before a resolution of the difficulty and its assignment to error, loss or diversion is possible. From the point of view of safeguards, where the critical time to trace materials maybe in hours if not in minutes, this historical information is only of very limited value. It can never say that an explosive critical mass has not been diverted. It can only put a reasonable limit on how many might have been.

THE GOAL OF ACCOUNTABILITY IN SAFEGUARDS

Traditional forms of industrial theft involve concealment of the acts of theft so that the thief can continue his employment and normal life. Accounting systems provide a deterent to such theft by rendering its exposure probable. They may also, if timely, provide aid through the discovery of theft to apprehension of the thief and the recovery of material.

In the present context one can distinguish two kinds of theft having accountability relevance. First there is an individual or group that seeks to continue employment supplementing its income from theft and therefore is trying to avoid exposure. For this group the goals of accounting usually are deterence and capacity for ultimate disclosure and traceability of loss. Secondly there is a thief seeking a one-time diversion of a large quantity of material. Such a thief can only be affected by a type of accounting that can quickly disclose the theft and indicate his guilt. He will seek to hide his theft only long enough to give him time to avoid pursuit or, if the quanitities he has stolen are insufficient for his purposes, to steal more.

Two of the most crucial roles of accountability are thus related to its deterent effect and its timely ability to detect large but subcritical

concealed diversions of a kind such that the thief will desire to steal more within a short time.

A third crucial role of accountability is the ability to detect very large diversions of material in the time period between its removal from "where it should be" and its physical removal from the plant to a place of concealment. This is the most difficult task since it may require detection in hours or less.

The explicit needs of accountability required by these goals are:

1. Deterrence of the long-term thief: high probability of ultimate detection and high probability of tracing of losses. Rapid detectability is of value primarily for tracing.
2. Detection of subcritical thief: high probability of discovery. The time scale needed depends upon the frequency with which thefts can be made.
3. Detection of gross theft: timeliness is crucial and daily information would be desirable.

It is not sufficient that an accounting system provide that a shortage in material show up in the measurements. Measured shortages may rise from faulty equipment, reading errors, recording errors, computer failures, accidental misplacement of materials, accidental

spillage, misalignments and many other sources. It is necessary that the accounting system have, in addition to a timely ability to detect shortage, a timely ability to trace the shortage to specific areas, batches of material, work shifts, or other categories in order that it can serve as a credible deterent, facilitate elimination of other causes, and make possible timely detection of the theft.

A plan to immediately tighten the physical security of the plant, and interviewing of staff, etc., in the event of a large measured shortage is also needed. If accounting procedures give daily checks they may discover in-plant diversions before physical removal from the plant is completed. They have little value if they are delayed until after removal.

In developing effective accountability procedures one can distinguish two kinds of stealable items that require sharply different approaches. There are:

1. Removal of container, substitution of content in containers, removal of identifiable objects, content of vaults, etc.
2. Removal of material in bulk state from processes or between processes, removal of unpackaged scrap.

Detecting the former represents a straightforward accounting problem, that can be attacked by standard procedures, as discussed in the recommendations below. They involve such measures as redundant measurement, redundant measurement responsibilities, remote files, tamper checking as well as tamper safing, frequent counting and spot checking.

Safeguards against the latter may require ingenious measurement techniques tailored to the diversion vulnerabilities of the particular process line in question. We recommend below that in the latter case both the AEC and licensees continually analyze for diversion paths and measurement technique needs in each individual plant on a continuing basis.

ACCOUNTABILITY: RECOMMENDATIONS

EMPHASIS ON MUF AND LEMUF

Because of the finite errors in the methods of analysis; because these errors cannot be reduced to a size which is much smaller than has been experienced in the past; because of the way in which errors must accumulate in the calculation of an inventory based on many measurements; because of the human factors and the statistics of the system; there does not appear to be any way in which the measurement of the total inventory of an operating plant, or even a large segment of that inventory, can ever be known to better than one tenth of one percent. At the present time the real possibilities are much closer to a one percent error in the complex systems used to generate fuels containing SNM. Much of the difficulty with plutonium is related to its complex chemistry and the extreme health hazard presented by this element. The same error, of near to one percent, can be expected in the more advanced uranium systems where efforts are being made to generate fuels which can operate at very high temperatures. These uranium fuels will be complex composites of refractory materials which require many operations to generate and each complexity introduces a new element of irreducible error. With the expected throughputs of thousands of kilograms per year these errors are too large to allow any significant safeguards dependence on MUF and LEMUF data.

Beyond the lack of sensitivity of the data generated is its lack of timeliness. Even on a monthly basis Inventories are difficult to finish

before the next inventory begins and the detection of a diversion after months time removes much of the significance of the detection. Even when an inventory change is detected, it is really necessary to check the whole inventory process for error and to redo the inventory to generate a better statistic before a declaration of diversion is justified. This process takes several weeks more. In the meantime any feeling of confidence is based on the physical protection system and the evidence that it has not been violated. The time delay in the inventory system is long enough to allow a skilled diverter to have constructed an explosive device before the system can reach a conclusion that diversion has taken place. On the basis of timeliness as well as on the basis of sensitivity the calculation of inventories as exemplified in the MUF and LEMUF concepts fail to provide safeguards.

RECOMMENDATION

We recommend that the concept of a periodic measure of material balance around large flows and inventories as expressed in the current concepts of MUF and LEMUF be abandoned as a basis of safeguards.

DOUBLE CONTINGENCY IN MEASUREMENT

One of the more likely techniques for diversion is the falsification of measurement either by a direct entry into the record of false numbers, alteration of instrumentation, the changing of the contents of a measured batch after measurement, or the substitution of one material for another of similar properties. In those instances where measurements are made by single individuals it would seem that there could well be another check of the same measurement in the normal operations of the process, especially if it was a simple determination, such as mass. A container of material could be weighed as it left one process area and weighted again as it entered the next. Some change in the recorded weights would be expected, due to the absorption of moisture for example, but a comparison of the measured change with that routinely expected would be a valid and useful check for tampering.

Where duplication of a measurement would not be an easy process, it should be possible to have representatives of two separate parts of the plant system observe the taking of a single set of measurements as a check on the accuracy of the step and the recording of the data. In many instances one can measure two or more properties of the batch with high precision so that tampering or replacement can be more easily

detected. Precise measurements can be made of the weight and neutron radiation from a container of material so that plutonium can not as easily be replaced with inert material. The results of the neutron radiation measurement can be kept inaccessible to the operator in a remote data bank for [illegible]n rechecking the container at a later time. With two or more precise measurements of the nature of a batch one can check accurately for changes in the contents without the need for an accurate measurement of the contents.

RECOMMENDATION

We recommend the adoption of a philosophy of double contingency in measurement through the scheduling of measurements out of and into process or storage steps the observation of measurements by two independent individuals with redundant responsibilities, and, where possible, the precise measurement of two or more parameters of a given batch for tamper checking purposes.

COUNTING OF OBJECTS

In many of the production operations involving SNM very large numbers of similar objects, like fuel pellets, are made. Because of the small size of the critical mass, large numbers of small batches of material are generated in all operations involving SNM. The large numbers of items and containers offer ways of adding to the amount of information about the production process and hence to the safeguards information. It should be possible to count the number of fuel pellets passing through a given step in the process, the number going into product, and the number going into salvage, in the way a bank counts coins.

The number of containers moved from one area or process step to another should be collected. The adoption of containers with easy to differentiate characteristics, colors, or shapes would allow the establishment of classes of containers, which could increase the information content of container counting.

The numbers of objects of different types moving about the system are easily subjected to analysis against an established model. Any deviation can serve as an indication of a change which might be be part of an internally generated diversion.

RECOMMENDATION

We recommend that any objects generated in operations involving SNM be counted as soon as an identifiable shape is established and that a number count of movements of these items be maintained as they progress through the process until identity is lost.

FREQUENCY OF MEASUREMENT AND ANALYSIS

For the detection of diversion there needs to be special emphasis on the timeliness of the data collected. The larger the rate of diversion the shorter the time to detection needed. For the diversion of large amounts of materials, several kilograms in the case of plutonium and several 10's of kilograms in the case of uranium-235, detection is needed within hours at the very most. Those measurements which can aid in the detection of diversions of large quantities of materials should be made frequently, but their cost can be low. Among them would be numbers from the counting of containers, the measurements of mass; and measurements which indicate the operating inventories of equipment on a continuing basis, such as liquid level, neutron and gamma background. These easy and frequently taken numbers, when combined with the numbers generated in the transfers between processes, can be of great importance in the detection of diversion. There should also be some measurements of the contents of storage areas and vaults on a continuing basis. While these measurements might not include the whole inventory on any given day, they should include a significant portion, say ten percent on a random basis, so that all containers would be checked within a month after they were introduced into the process.

The flow of data from all measurements, large and small, should be compared to expectations on a daily basis. Much of the data should be put into a computer data bank and immediately checked against expectations.

RECOMMENDATION

We recommend that emphasis be given to the frequent collection and analysis of easily obtained numerical information about SNM processing plants. This information should be compared against a working model of the system on a daily basis and where possible should be compared against expectations immediately. Every attempt should be made to employ measurement techniques that yield material balance consistency checks within a period of one day.

DIRECT DETECTION OF DIVERSION BY MEASUREMENT TECHNIQUE

Because of the relatively large percentage errors inherent in most of the measurements systems which can be applied to the detection of the diversion of SNM on a timely basis, it is necessary to apply them directly to the process stream. The use of by-difference techniques between the flows in large streams is sure to result in a lack of sensitivity. In a manner analogous to the way door monitors are used to detect the diversion of small amounts of SNM moving through the entrances of a building, there should be measurements of the possible small flows out of the main processing lines to salvage operations through direct and expected routes like the collection of grinding swaf, or through indirect routes like the materials collected on filters in the ventilation system. These methods do not have to be too sensitive to be useful if the method of diversion are anticipated. For example, one problem is the passing of SNM through portals opened for a test or real emergency situation. Here the only requirement is the ability to detect the diversion of a gross amount through an infrequently used path. The effort against diversion should be based on a continuing "diversion path analysis" so that the means of detection are continually tuned to the problems posed by diversion.

RECOMMENDATION

We recommend the establishment of a continuing effort on "diversion path analysis" by the AEC with the objective of insuring an increasingly effective application of advanced measurement techniques to the solution

of safeguards problems. We further recommend that the licensees be required to perform such analyses in their facilities, and to formulate measurement schemes to protect against every potential diversion path discovered.

SAFEGUARDS AS AN ORGANIZATIONAL FUNCTION

Since safeguards are really the protection of the system against events which are determined more by people and their attitudes from day to day than by the outcome of many fixed decisions of some time past, what is done on one day affects the nature of the result on the next. To assure the dynamic character of safeguards activities they must be the primary activity, even if not the sole activity, of at least one organizational position of authority in all groups which are involved with SNM. This position needs to be structured so that there is a very frequent re-examination of the basis of the ongoing safeguards program in cooperation with all of those involved in production, physical protection, accounting, quality assurance, safety, and personnel in order that the condition of the operation and its people can be treated as part of the whole problem. There must also be an ongoing analysis of the attitudes of the people in the plant and the community around the plant.

RECOMMENDATION

We recommend that an organization be established by each licensee with the duty of examining all of the data which relates to safeguards, including material flow information and information about personnel. We further recommend that as part of its responsibility this organization should make a daily determination of the most likely deviation from measurement expectations which could have safeguards significance and investigate

it. The committee should have the duty to suggest changes which might be made in the materials flow measurement, the physical protection technique or the assignment of personnel that could promote safeguards efficiency.

CONCLUSION

It is our hope that this study will contribute to a new understanding of the level of danger represented by the potential acquisition of explosive quantities of special nuclear material by malevolent people. We feel that the danger is large and growing due to the widespread and increasing dissemination of precise and accurate instructions on how to make simple nuclear weapons, and due to the increasing professional skills, intelligence networks, finances, and level of armaments of terrorist groups throughout the world.

The essence of the problem as we see it is the following. The potential harm to the public from the explosion of an illicitly made nuclear weapon is greater than that from any plausible power plant accident, including one which involves a core meltdown and subsequent breach of containment. The factors involved in preventing the illegal acquisition of special nuclear material and the subsequent manufacture of nuclear weapons have received a great deal less attention than those associated with power plant accidents. The relevant regulations are far less stringent and we feel they are entirely inadequate to meet the threat. The seriousness of the problem demands a clear commitment by the AEC to bring the risk to the public from safeguards problems down to the level of public risk associated with the operation of nuclear power plants.

The report contains a number of specific recommendations. By far the most important is that the threat represented by unauthorized acquisition of special nuclear material and the adequacy of systems to meet that threat, should be viewed in terms of design basis incidents. Safeguards systems should be designed to assure that no single failure of an active or passive feature of a system will lead to inability of that system to perform its function. In addition to this general recommendation we have made specific recommendations about physical protection, the need for better intelligence, and the use of dynamic testing.

We feel that the use of MUFs and LEMUFs have very little if any value for safeguards and that the current use of these techniques is probably not worth their cost. We do believe that one can do something about safeguards by the use of accounting and measurement, but this would require a new approach to the subject. It will be necessary to direct the accountability effort not toward computing an overall balance as it now is, but toward the detection of diversion. We recommend that the current concepts of MUF and LEMUF be abandoned as a basis of safeguards and that they be replaced by a different type of accounting and measurement system, which we have sketched out in the report.

Even though safeguard regulations have just been revised and strengthened, we feel that new regulations are inadequate and that immediate steps should be taken to greatly strengthen the protection of special nuclear materials. We hope that this paper will contribute in a positive way to the speedy implementation of such steps.

MEMORANDUM

REFER		NOTED	
TO	DATE	BY	DATE
RETURN TO		FILE	

PA 22-4
S-63

TO: Mr. Patrick J. Falvey, General Counsel
FROM: Morris Sloane
DATE: April 1, 1975
SUBJECT: KENNEDY AIRPORT - PROCEDURE FOR SHIPMENT OF PLUTONIUM

REFERENCE:

COPY TO: Messrs. Pattarini, Dornfeld, Lee; Mrs. Canale

Reference is made to the call from the Governor's Special Assistant and your request for information concerning shipments of plutonium through Kennedy Airport and procedures covering these shipments.

Attached is a white paper which is a summary of procedures covering the treatment of hazardous cargo at the airport. The highlights of the paper are that FAA Regulations control the packaging, labeling and storing of hazardous material on the aircraft; and Airport Rules and Regulations require all tenants to notify the Port Authority 24 hours in advance of handling any hazardous cargo through the airport. The requirement for notifying the Port Authority 24 hours in advance is to enable our Police and Fire Rescue Units to properly handle an incident involving an aircraft or truck carrying hazardous cargo, or a problem which could occur during its storage at the airport.

Also attached is a memorandum dated 3/28/75 which summarizes radioactive shipments at Kennedy for 1974. The memorandum contains six plutonium shipments on which the Port Authority received 24 hours advance notice. A seventh shipment of plutonium was also moved through the airport on Flying Tigers Flight 041/10 on December 10th with prior notice (see att. Flying Tigers letter dated 12/9/74). In addition, two shipments of plutonium moved through the airport on Flying Tigers, one in December 1974 and one on February 24, 1975, both without notice to the Port Authority.

You mentioned that the Governor's representative referred to the New York Times article on March 27th which stated that the "Nuclear Regulatory Commission has stopped issuing licenses to import and export nuclear reactors and several materials such as plutonium ..."

I discussed a potential problem with our requirement for 24 hours notice on plutonium shipments with Mr. James O'Reilly, Director of Region One of the Nuclear Regulatory Commission. Mr. O'Reilly agreed with our need for 24 hours notice and asked to be advised personally if we did not receive the notice so that they could take forceful action against the licensee. Mr. O'Reilly further advised that his office is personally inspecting every shipment of plutonium and that present procedures include notification to the Port Authority Police at the George Washington Bridge, and New York City Police escort of the shipment through the city. When I mentioned the above news article, Mr. O'Reilly advised that it was in error. The Commission has

"8"

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PA 90-C
5-63

TO: Mr. Patrick J. Falvey - 2 - April 1, 1975

not stopped issuing licenses for import and export of plutonium, however, each specific shipment is being reviewed and approved by the Commission rather than being handled by their staff. This was confirmed in this morning's Times article.

I have advised the General Manager at Kennedy of my discussions with Mr. O'Reilly of the Nuclear Regulatory Commission.

M. Sloane
Deputy Director of Aviation

Atts.

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

----------X

THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and VERNON B. ACREE as Commissioner and FRED R. BOYETT as Regional Commissioner,

Defendants.

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75 Civ 212 (WCC)

AFFIDAVIT IN SUPPORT OF MOTIONS FOR TEMPORARY RESTRAINING ORDER AND PRELIMINARY INJUNCTION

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

JOHN F. SHEA, III, being duly sworn, deposes and says:

1. I am an Assistant Attorney General in the Department of Law of the State of New York, on the staff of the Bureau of Environmental Protection in the office of the Attorney General LOUIS J. LEFKOWITZ, and am assigned to the above entitled action. This affidavit is submitted in support of the plaintiff's motion for a temporary restraining order and a preliminary injunction.

2. The State of New York's Verified Complaint in this action requests both declaratory and injunctive relief from this Court. A judgment is sought declaring that defendants' actions in licensing, approving, allowing or executing, directly or indirectly, the air transport and related connecting transport of plutonium and other special nuclear materials to, from, in or

over the City and State of New York and the United States and its territories, without having prepared and filed an Environmental Impact Statement in accordance with the National Environmental Policy Act of 1969 ("NEPA") [42 U.S.C. § 4321 et seq.] assessing the impacts of such transport of special nuclear materials, are in violation of NEPA. Moreover, a permanent injunction is sought to enjoin, annul and set aside all present and future licenses, approvals and other actions of defendants, their agents, servants, employees, and attorneys and all persons in active concert and participation with them which, directly or indirectly, permit or execute the transport by air and related connecting transport of plutonium and other special nuclear materials to, from, in, and over the City and State of New York, and the United States and its territories.

3. This litigation involves the practice of shipping by air "special nuclear materials," which, by regulatory definition include plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Nuclear Regulatory Commission (hereafter "NRC") may determine to be special nuclear material. A number of federal agencies are involved with such shipments in varying capacities. The Department of Transportation, for example, regulates shipping container design (see 49 CFR Parts 170-189, 14 CFR Part 103 and 46 CFR Part 146). The NRC presently issues licenses permitting the import, export and domestic transport of special nuclear materials; such licenses do not restrict the mode of transport to any particular form. Upon information and belief numerous air shipments of plutonium and other special nuclear materials under NRC license have passed through John F. Kennedy International Airport.

4. Upon information and belief, there are presently thirty (30) domestic shippers licensed by the NRC to transport

special nuclear materials including plutonium by air within the United States. Such domestic shipments, unlike import and export shipments, are not separately licensed; rather, the particular shippers are licensed to carry unlimited numbers of shipments within the cargo specifications of their respective licenses. No more than seven days notice to the NRC of a shipment is required of such a domestic licensee.

5. Upon information and belief, air shipments of plutonium and other special nuclear materials will be made in the immediate future by defendant Energy Research and Development Administration, which independently ships such materials without any licensing by, or notification to, the NRC or any other federal, state or local authorities.

6. Plaintiff has been informed by a Nuclear Regulatory Commission official that an import shipment of plutonium dioxide (PuO_2) has already been licensed and scheduled for flight into John F. Kennedy International Airport in the immediate future (see Supplemental Affidavit of John F. Shea, III, which affidavit has been requested to be sealed, for details of said shipment).

7. Upon information and belief none of the defendants herein have prepared and filed with the Council on Environmental Quality a full Environmental Impact Statement in accordance with NEPA which assesses the impact of the air transport and related connecting transport of special nuclear materials to, from, in, or over the City and State of New York or to, from, in, or over the United States and its territories. Certain of the defendants have issued internal documents on tangential issues which they have variously titled "environmental assessments" or "environmental appraisals." Such incomplete and unfiled documents do not, however, meet the statutory requirements of NEPA.

8. The lives of the people of the State of New York have been placed in serious and immediate danger by the air shipment and related connecting transport of these special nuclear materials. As demonstrated in the Affidavit of Marvin Resnikoff in support of the motions for temporary and preliminary relief made herein, sworn to April 25, 1975, an accidental release of the most minute quantities of plutonium dioxide due to an aircraft crash could result in the death of over 100,000 people. Peter N. Skinner's Affidavit and Supplemental Affidavit in support of the motions for temporary and preliminary relief made herein, sworn to May 2, 1975, demonstrate the devastating toxicity of these substances and their prime suitability for acts of terrorism. The attractiveness of these materials to terrorists and saboteurs is, as Mr. Skinner shows, attributable to this toxicity factor and the relative ease with which these materials can be manufactured into nuclear weapons. Mr. Skinner's affidavits explain as well how the investigation by the Attorney General of the State of New York supervised by Mr. Skinner, revealed that at least 124 non-security cleared individuals had knowledge of details of one special nuclear materials shipment prior to actual shipment date. For purposes of public safety and security it has been requested that Mr. Skinner's Supplemental Affidavit be sealed by this Court.

9. It is stressed that this litigation concerns itself only with the air transport and connecting transport related to such air transport of special nuclear materials. Other radioactive materials, such as radioactive pharmaceuticals, other modes of transportation and the issues involved with those modes and materials are not dealt with in this suit.

10. Plaintiff has demonstrated that there is a substantial likelihood of ultimate success on the merits and has, as well, shown there to be severe risks of immediate and

irreparable injury and death to the citizens and residents of this State because of defendants' actions.

11. Plaintiff has no adequate remedy at law. Plaintiff has made no prior application for the relief requested herein.

WHEREFORE, it is respectfully requested that the Court grant plaintiff's motions for

a) an order preliminarily enjoining, annulling, and setting aside, pending the final determination of this action, all present and future licenses, approvals and other actions of defendants, their agents, servants, employees, attorneys and all persons in active concert and participation with them which, directly or indirectly, permit or execute the transport by air and related connecting transport of plutonium and other special nuclear materials to, from, in, and over the City and State of New York and the United States and its territories, and directing defendants to forthwith instruct nuclear materials shippers, air and other carriers, and other persons and entities procuring or executing such transport that such preliminary injunction is in effect; and

2) an order directing defendants to show cause before this court why such a preliminary injunction should not be granted; and

3) an order temporarily restraining, annulling and setting aside, pending the determination of plaintiff's motion for a preliminary injunction, all present and future licenses, approvals and other actions of defendants, their agents, servants, employees, attorneys and all persons in active concert and participation with them which, directly or indirectly, permit or execute the transport by air and related connecting transport of plutonium and other special nuclear materials to, from, in

and over the City and State of New York and the United States and its territories and directing defendants to forthwith instruct nuclear materials shippers, air and other carriers, and other persons or entities procuring or executing such transport that such temporary restraining order is effect.

JOHN F. SHEA, III

Sworn to before me this
2nd day of May, 1975

Assistant Attorney General
of the State of New York

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

----------X

THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and [illegible] B. ACREE as Commissioner and [illegible] R. BOYETT as Regional [illegible]missioner,

Defendants.

AFFIDAVIT

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STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

PETER N. SKINNER, being duly sworn, deposes and says:

For the past five years I have been employed as the Environmental Engineer in the Environmental Protection Bureau of the New York State Department of Law maintaining my business address at Two World Trade Center, New York, New York. My responsibilities have included the development and presentation of technical issues in complex environmental litigation and proceedings involving the impacts of the importation of liquefied natural gas, air, water and noise pollution, fishkill abatement, nuclear and fossil fuel power plant impacts, and water supply management. I am participating in this office's effort before the Nuclear Regulatory Commission concerning the Nuclear Fuel Services' reprocessing plant application on a number

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of radiological issues. Other proceedings or litigation include the Generic Environmental Statement on Mixed Oxide Fuel (plutonium recycle), the Liquid Metal Fast Breeder Reactor Program Environmental Statement, the Summary Table S-3 appeal, and the Management of High Level and Transuranium Contaminated Radioactive Waste.

I hold a Bachelor of Arts and Bachelor of Science from Lehigh University. I have authored numerous affidavits, statements and comments in the proceedings and litigation in which our office has been involved.

I make this affidavit in support of the motion for a temporary restraining order and the motion for preliminary relief.

INTRODUCTION

I have been supervising an investigation into the dangers associated with the use and shipment of radioactive materials. Analysis by our staff and confirmations by outside experts as referenced in appendices have demonstrated that shipments of plutonium and special nuclear materials have been commonplace and that each represented a significant danger to the health and safety of people of the State of New York.

The preliminary investigation conducted by our office has disclosed the following information:

A. Shipments.

As part of the refueling of foreign reactors many shipments of plutonium and other fissile materials have been shipped through the New York metropolitan airports. More are planned. See Appendix A.

B. Aircraft Accidents.

The shipping containers required by federal regulations are not adequately designed for the extreme environments possible in an air crash

either in mid air or upon landing.* A possible air crash could release some of the contents for dispersion into the surrounding area.

C. Dispersion.

Plutonium, once distributed in the environment whether outside or inside a building, represents a very long-lived (24,000 year half-life) danger to citizens exposed to it.

D. Value of Material to Saboteurs.

Plutonium and Uranium 235 are materials which can easily be fashioned into crude nuclear weapons capable of destroying and contaminating vast areas. Plutonium as an aerosol can be thoroughly dispersed, thereby exposing many thousands of citizens to toxic levels of radioactivity.

E. Terrorism.

Due to the systems and procedures presently in force, hundreds of people without security clearances know the route, arrival time, contents, and containerization of these shipments, often many days in advance. It is possible for any one of these people to alert outsiders, for example an organized group, for an assault on the shipment with intent to divert the materials for later use or for the purpose of immediate terrorist acts.

I. BACKGROUND

Plutonium is a man-made substance produced in nuclear reactors. Plutonium-239, its principle isotope, was used to destroy Nagasaki, Japan, in 1945. Experts call it one of the most toxic substances known to man, as will be discussed in the Toxicity section of this affidavit.

Plutonium is a by-product of the fissioning of uranium in a nuclear reactor. A diagram and description of the nuclear fuel cycle is presented in Appendix B. This description

*See affidavit of Marvin Resnikoff which calculates shipping container integrity and lung damage due to releases of plutonium.

of the nuclear cycle will provide a basis for understanding our concerns for the safety of the people of New York State.

In the course of our investigation we consulted with agencies on federal, state and local levels. Upon the information supplied to us by those agencies and upon belief on July 29, 1974, and February 25, 1975,[1] shipments of plutonium arrived in New York from Italy via Brussels, on Seaboard World Airlines. (Since February 27, 1974, there have been at least 6 shipments of plutonium.) The plutonium, in oxide form, was then loaded onto Tri-State Corporation trucks and transported through New York City, New Jersey, and Pennsylvania, and driven to Westinghouse fuel fabrication plant in Cheswick, Pennsylvania. When refabricated into fuel rod forms, the plutonium would then be shipped back to New York and flown to the Italian reactor from which it originally came for recycling.

Plutonium has also become an important commodity traded on different continents. This exchange has occasioned some of the shipments tabulated in Appendix A as well.

II. TOXICITY

Plutonium has been defined by some experts as the most toxic substance known. Its principle isotope, plutonium 239, has a half-life of 24,000 years. Once created in nuclear reactors and separated, it is virtually an eternal danger.

1. The plutonium oxide was flown into New York on a Douglas DC-8 freighter which was on a general all freight, non-stop flight. The plutonium was packaged in LLD1 shipping containers which were placed inside a transport "igloo" which was then put on board the cargo jet. (See description of LLD1 container and container strength in affidavit of Marvin Resnikoff) These 55 gallon drums were, upon arrival at J.F.K., brought off the plane and temporarily stored in a cargo building. They were then shipped by truck through New York City between the hours of midnight and 6 A.M.

Its physiological effects show its most pernicious aspects. If absorbed by human tissues, it is carried into the bloodstream where it accumulates and settles in the bones. Once deposited here, it can cause bone cancer. Moreover, it has even more deadly effects if inhaled.[2]

> "When lost into uncontrolled air these particles can remain suspended for a significant time, and if inhaled they are preferentially deposited in the deep lung tissue, where their long residence time and high alpha activity can result in a locally intense tissue exposure. The lung cancer risk associated with these radiologically unique aerosols is unknown to orders of magnitude . . . The fact that under present standards, the permissable air concentrations are about one part per million billion is a commentary on plutonium's potential as a pollutant."

Donald P. Geesaman, "Plutonium and the Energy Decision," in The Energy Crisis, ed. R.S. Lewis and B.I. Spinrad, 1972, pp. 58-59 quoted in The Plutonium Decision by Speth, Tamplin and Cochran.

As the physicists Tamplin and Cochran estimated, the lung cancer risk associated with hot particles of plutonium is comparable to that of botulin toxin, a biological warfare agent.

III. AIRCRAFT ACCIDENTS

Aircraft accidents obviously occasion extremely violent environments for persons and property. I have reviewed recent aircraft accidents tabulated by the National Transportation Safety Board to ascertain how many of these crashes are significantly destructive and where such crashes occur.

2. The nose will filter out all airborne particles with a diameter of 10 microns or more and 95% of those particles with a diameter of 5 microns or more; very few particles with a diameter of less than 3 microns are filtered out. Since recent shipments of plutonium have arrived in powdered form with a particle diameter of between .92 micron and 1.12 microns, these particles would have very little trouble finding their way to the lung if released from their containers. If a thousandth of a gram of plutonium is taken into the lungs, this being an invisible speck of dust, it will kill anyone -- a death from a massive fibrosis of the lungs taking place in a matter of hours or at most a few days. The Curve of Binding Energy, p. 44, John McPhee; Farrar Strauss & Giroux (1973).

The National Transportation Safety Board has arranged aircraft accidents into four specific categories in terms of damage: destroyed, substantial damage, minor damage, and none.

When an aircraft is destroyed by an accident it has suffered complete ruin and is not capable of being repaired. If an aircraft has suffered substantial damage due to an accident, it can be repaired, but it has undergone considerable damage to both wings and fuselage, and as it stands, the plane is not airworthy. Minor damage from an air accident is where, for example, an aircraft has undergone damage or puncturing of the fuselage and/or wings, but is still airworthy. The danger of fire, destruction of cargo containers, destruction of cargo itself, as well as dispersal of cargo, is significant in accidents involving significant or substantial damage. In order to place the possible danger involved into perspective, provided below are the statistics on aircraft accidents during various stages of operational use as published by the National Transportation Safety Board for the years 1970 through 1973.[3]

	AIRCRAFT DAMAGE				
OPERATIONAL PHASE	DESTROYED	SUBSTANTIAL	MINOR	NONE	TOTAL
STATIC	0	4	3	10	17
TAXI	0	12	2	2	14
TAKEOFF	6	15	2	2	25
INFLIGHT	4	12	7	54	75
LANDING	20	39	2	2	63
TOTAL	30	82	16	70	198

See page 6A for footnote (3).

3. These statistics have been compiled from the following: p. 38, Annual Reviews of Aircraft Accident Data, U.S. Air Carrier Operations 1970-1972, Adopted April 11, 1974, National Transportation Safety Board, Washington, D.C., Report Number: NTSB - ARC - 74-1; and p. 38 Annual Reviews of Aircraft Accident Data, U.S. Air Carrier Operations 1973, Adopted October 24, 1974, National Transportation Safety Board, Washington, D.C. Report Number: NTSB - ARC - 74-2.

There are at least two important points to be garnered from the above statistics. First, the majority of aircraft accidents (112 out of 198 recorded from 1970 to 1973) cause substantial or more damage. This means most aircraft accidents carry with them the potential danger of fire, destruction and dispersal of cargo as discussed earlier. Second, the vast majority of aircraft accidents where damage was substantial or more, occurred in or around airports (96 out of 112 accidents from 1970 to 1973).

IV. TERRORISM

Upon information and belief recent NRC guidelines have ordered that plutonium be shipped as an oxide. The alternative forms for shipment are plutonium nitrate, a liquid or plutonium metal, a solid. The nitrate form tends to leak out of shipping cannisters; the metal is very flammable. Unfortunately, the oxide, PuO_2, since it is a powder, is a perfect material for terrorists. It can be easily dispersed causing death among the exposed population. (See description in Marvin Resnikoff's affidavit).

Briefly a possible terrorist scenario would be as follows: A person using a crude fuse could release plutonium as an aerosol into the air-conditioning system of a major office building, such as the World Trade Center. The saboteur would need to release only part of a "tuna fish can" full of plutonium into this system to kill all residents of 16 floors. The calculations supporting this conclusion are contained in my second affidavit herein which we ask the court to seal for security reasons.

Assuming that a plutonium or U-235 shipment was stolen, there are a number of other terrifying possibilities for its use.

> "One person having access to roughly a dozen kilograms of plutonium oxide of the type planned for use in [nuclear] fuel . . . could design and build a workable nuclear explosive device, using materials and equipment that can be purchased commercially in most cities throughout the world, for total costs

substantially below $10,000. The person would have to be reasonably inventive and adept at using laboratory equipment and tools of about the same complexity as those used by undergraduate student in chemistry and physics laboratories and machine shops, and have a basic understanding or nuclear physics or engineering at a level comparable to typical undergraduate courses in these subjects, and of how to handle conventional high explosives safely."

The Curve of Binding Energy, supra p.

The plutonium bomb is quite simple in design and has been discussed in detail in the December 1973 issues of the New Yorker. See my second affidavit. It is made of a core of plutonium surrounded by a neutron reflector. Around this is a layer of TNT with some form of detonator.

When the bomb is detonated, the explosive force of the TNT travels inward as well as outward. This inward force compresses the plutonium. In this much more dense state, the plutonium reaches criticality and the result is a chain reaction and a nuclear explosion. This could cause in addition a dispersal of unfissioned plutonium. In the size of a softball, plutonium is capable of mass destruction. (Speth, Tamplin, Cochran, The Plutonium Decision p. 1, Sept. 1974).

IV. WHO KNOWS ABOUT A SPECIFIC SHIPMENT OF PLUTONIUM?

With all the risks of terrorism described herein one would expect that existing security arrangements would be very tight. An extensive study by the Attorney General's office of the number of persons knowledgeable of the details of the transport of plutonium through New York City is described in my supplemental affidavit.

The purpose of the Attorney General's study was to determine exactly how many people were aware of the details of

the specific plutonium shipment of February 25, 1975 (from Brussels to New York), and how far in advance of the shipment these people knew about it. It was determined how many persons knew some or all of the following:

1) the exact time of a shipment arrival of plutonium in the airport,
2) the exact place of arrival,
3) the airline carrier,
4) the final destination,
5) the quantity of plutonium, and
6) the transport route throughout the city.

To our great alarm, we found that at least 124 people in eleven public and private agencies knew details of this specific shipment of plutonium before it occurred. This figure represents the most conservative total of knowledgeable people. Every single person in this total can be accounted for. It is obvious that many more people might have known some details of the shipment. The breakdown of this total is contained in my second affidavit which we ask the court to seal.

CONCLUSIONS

In this period when terrorism and aircraft disasters are commonplace the defendants' responsibility to the public demands a careful quantification and assessment of the impacts of this mode of shipment.

Peter N. Skinner
PETER N. SKINNER

Sworn to before me this
29th day of April, 1975

Assistant Attorney General
of the State of New York

APPENDIX A

RECENT SHIPMENTS OF PLUTONIUM THROUGH KENNEDY AIRPORT

Date		Wt. (Kgs.)
2/26/74	Export	12.5
4/3/74	Export	24.7
7/29/74	Import	48.3
9/27/74	Export	36.5
10/19/74	Export	36.5
2/25/75	Import	45.1

APPENDIX B

FUEL CYCLE DESCRIPTION

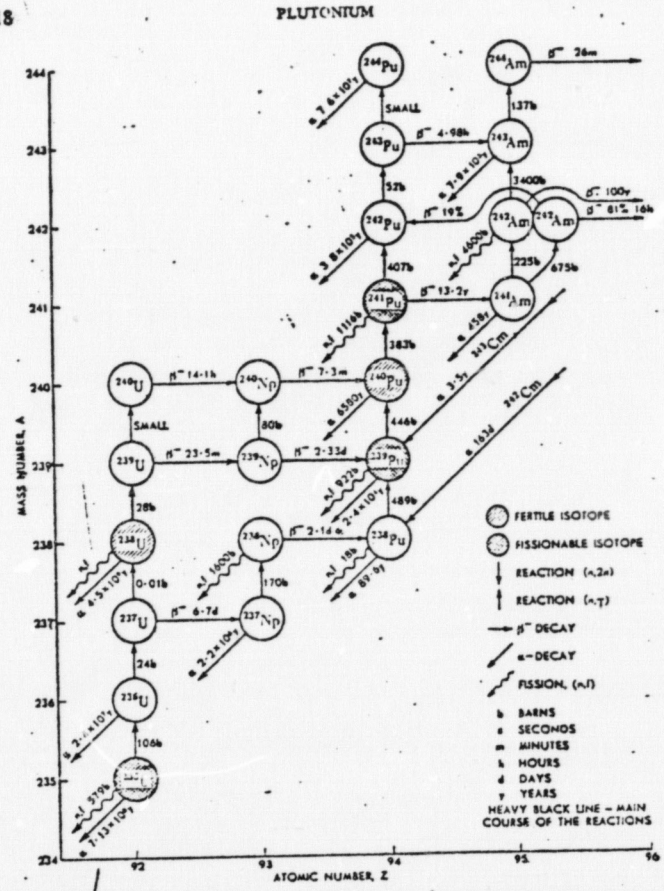
The first step in the production of nuclear energy, and ultimately plutonium is the mining of uranium ore. Once mined, either in an open pit or underground, the uranium ore is sent to be refined. The concentration of U-235 and U-238 in natural uranium is about 0.7% and 99.3% respectively. But, U-235 and not U-238 is fissile. Therefore, uranium must be enriched to increase the likelihood of fission, the basis of nuclear reactions. The uranium is extracted from the ore and is concentrated into a semi-refined product called yellow cake. This yellow cake is converted to the volatile uranium hexafluoride (UF_6) gas which is the feedstock to the enrichment plant. Uranium is thus enriched to about 2% to 4% concentration, decreasing U-238 from about 99% to 96%. The enriched UF_6 is converted into solid uranium oxide, UO_2. At the fuel fabrication plant, such as the one in Chesvick, Pennsylvania, solid uranium oxide is formed into pellets, loaded into stainless steel tubes, and fitted with end caps which are welded to form a complete fuel rod. Arranged into fuel bundles, these fuel rods are then transported to power reactors. In the nuclear reactor, a series of reactions occur.

Once placed in a nuclear reactor, the enriched U-235 begins to split up (fission), spewing neutrons and heat throughout the fuel bundles. Uranium-238, during the spontaneous fission of the nearby U-235, forms uranium-239 when a free neutron enters its nucleus. Because of the new ratio of protons to neutrons, the U-239 struggles for stability and then decays into neptunium 239. This same process of decay next yields plutonium-239 with

9. protons and 145 neutrons. Thus, in four basic steps, Pu 239 has been produced as a result of the transmutation of U-238. U-235, meanwhile, gets burned down to less than a 1% concentration. See reaction diagram which follows. At this point the new plutonium itself is fissioning and thereby helping out to maintain the reaction in the reactor. However, the presence of other reaction products eventually reduces the efficiency so much that a new core of fuel bundles must be inserted in the reactor and the old ones removed.

The spent fuel rods containing the U-238, U-235, fission products and plutonium are then sent to a reprocessing plant, for example, the Nuclear Fuel Services plant in West Valley, New York. In this plant the uranium, plutonium, and other waste products, are chemically separated. The present design of the nuclear fuel cycle calls for a recycle of the uranium and plutonium because they are both fissionable. The uranium must be re-enriched before re-fabrication but the plutonium can be inserted just as it comes out of the reprocessing plant. A typical assay of plutonium appears in this Appendix. This system of recycling necessitates, of course, the transport of plutonium from the reprocessing plant to the fuel fabrication plant. The shipments in question in this litigation are all part of this stage of the fuel cycle.

Recycle of plutonium has been attempted in the United States only on an experimental basis. The Nuclear Regulatory Commission has thus far refused to authorize any commercial use in this country of fuel mixed with plutonium pending review of the entire recycle issue and safeguards questions. See WASH 1327 - Generic Environmental Statement on Mixed Oxide Fuels.



Nuclear reaction of the synthesis of plutonium isotopes in a reactor during irradiation of uranium.

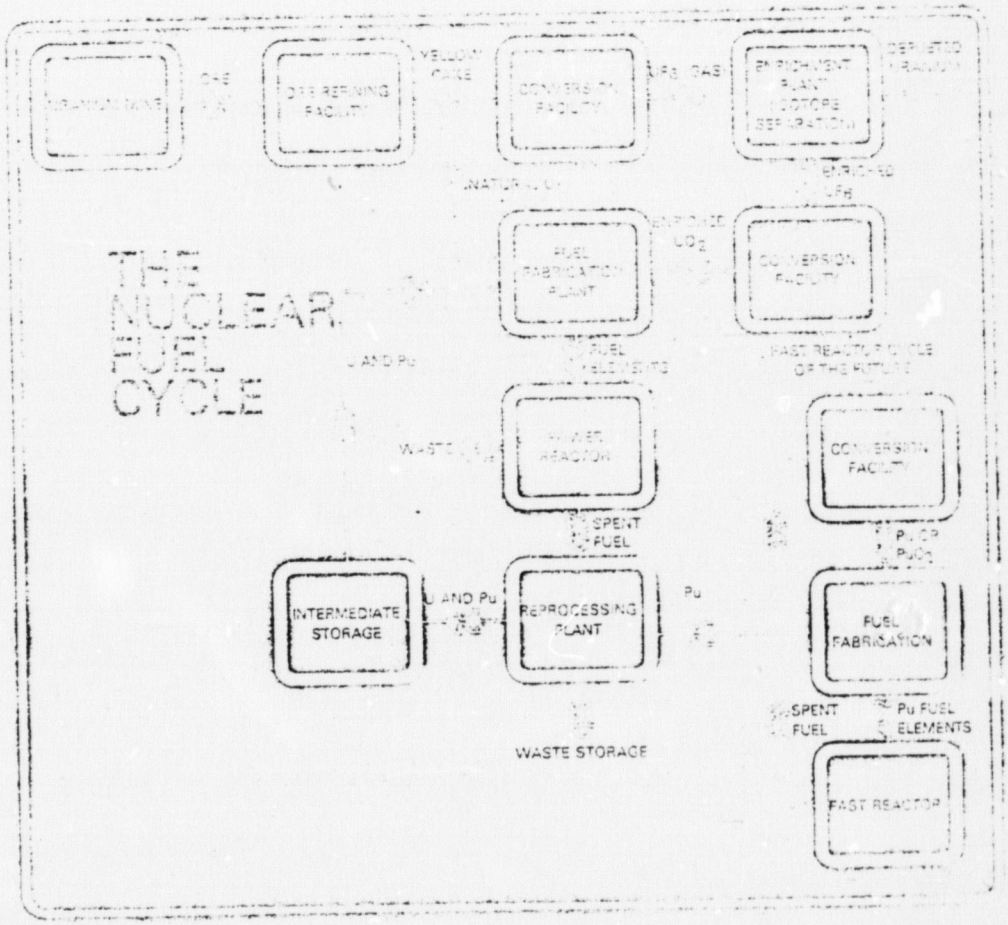
ISOTOPIC PERCENT COMPOSITION BY MASS

	7/29/74		2/24/75
Pu_{238}	0.596%		0.758%
Pu_{239}	72.0[illegible]%		71.930%
Pu_{240}	18.692%	← .92 to 1.12 Micron particle size →	18.095%
Pu_{241}	7.055%		7.414%
Pu_{242}	1.655%		1.803%
TOTAL MASS	45.1298Kg		48.278Kg

(Information obtained from Westinghouse Atomic Division)

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After reprocessing, retrieved uranium necessitates a higher degree of very costly enrichment which is not presently justified from an economic standpoint. To my knowledge none of the uranium reprocessed in the United States to date has ever been reused in reactors in this country.



UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and VERNON B. ACREE as Commissioner and FRED R. BOYETT as Regional Commissioner,

Defendants.

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AFFIDAVIT

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STATE OF NEW YORK)
: SS.:
COUNTY OF ERIE)

MARVIN RESNIKOFF, being duly sworn, deposes and says:

I reside in Buffalo, New York, and maintain my business address at Rachel Carson College, State University of New York at Buffalo, Amherst, New York 14261, where I am a lecturer.

I graduated from the University of Michigan with a PhD in Theoretical Physics, May, 1965. A listing of my professional and educational experience is attached, along with a list of publications. I have studied mathematical physics, mechanics, statics, neutron diffusion, nuclear physics, high energy physics, and statistical mechanics, among others, and have taught several courses in the same subject areas.

For the past year and a half I have been a consultant to several citizen groups, primarily the Sierra Club, Niagara

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Group, in Buffalo. In this capacity I have been able to stay current with the applications of numerous disciplines. I have been coordinating the intervention of the Sierra Club in the Nuclear Regulatory Commission proceeding concerning a construction permit for Nuclear Fuel Services, a fuel reprocessing plant located in West Valley, New York. As part of the examination of the Nuclear Fuel Services application, I have had to use methods of analysis which are employed in this affidavit, that is, diffusion analysis, structural analysis, and dosimetry.

INTRODUCTION

The New York Attorney General's office requested that I perform a preliminary safety analysis of air transport shipments of plutonium into J.F.K. International Airport.

The questions explored in this analysis can be summarized as follows:

A. Can plutonium dioxide (PuO_2) be released in a credible aircraft accident at or over J.F.K. International Airport?

B. Assuming a small percentage of a shipment is released, what are the consequences:

1) Under certain meteorological conditions, how would the release be distributed in the atmosphere?

2) What would be the biological impact on man as a result of an exposure to plutonium so distributed in the atmosphere?

The discussion will be presented in three parts. I first address the question of whether plutonium dioxide (PuO_2) can be released in a credible accident. This is obviously the

threshold question. If the containers are so constructed that no material could be released under any circumstances, then there is no hazard. I do not believe this to be true. As will be discussed in the ensuing pages the central container for PuO_2, under Department of Transportation regulations, is approximately the size of a "tuna fish can" and contains approximately 2.5 kilograms of PuO_2 or 5 1/2 pounds. For purposes of my discussion I assume that 1/2 of the contents of such a can, or approximately only 2.8% of a representative shipment is released. The representative shipment referred to was that which entered J.F.K. Airport on July 29, 1974, constituting 44.6 kilograms of PuO_2. Assuming such a small quantity of PuO_2 is released, what are the consequences? This involves two questions. Assuming certain meteorological conditions, how does a 2.8% release distribute itself in the atmosphere? From the air concentrations determined, we can then proceed to the question of the biological effect of an uptake of plutonium. To address this question properly, we must assume a lung model. A lung model is a description of the eventual deposit of radionuclide particles once inhaled and the biological impact therefrom. The models utilized herein have been developed by the AEC and EPA. These questions are addressed in turn in the remainder of the affidavit.

1. After reviewing the containerization information given to me by the NRC, I conclude that an airplane accident is possible in which releases of PuO_2 may take place, in sufficient quantities to be injurious to the health and safety of the public.

2. Under possible meteorological conditions, between two thousand and forty-six thousand lung cancers could develop from a 2.8% release, excluding fatalities to persons at the airport.

3. Under less likely, but possible, conditions, I will show that a hundred thousand persons, within a 100 square mile area, could develop lung cancer from a 2.8% release.

These calculations take no account of the effects due to resuspension of PuO_2, nor do they enumerate the considerable economic effects. It should be remembered as well that these calculations do not consider the effects of a deliberate dispersal of PuO_2, by a saboteur for example. In such a case, depending on the amounts of PuO_2 diverted and dispersed, the figures concerning death included herein would be gross underestimates. (See other supporting affidavits in this regard)

I. RUPTURE OF A SHIPPING CANISTER

The threshold question clearly is as follows:

Is it possible to rupture a shipping container in a credible aircraft accident? (See affidavit of Peter N. Skinner concerning the scope of damage in aircraft accidents).

We begin with a description of a PuO_2 shipping container. The model employed is LLD-1 model, which appears in WASH-1279, Directory of Packagings for Transportation of Radioactive Materials, p. 31 (approval no. 4960). The PuO_2 is packaged in sealed tin can, "tuna fish" size. This can is wrapped in a polyethylene bag. Two or three of these cans are placed in a no. 3 "fruit juice" can, which is also wrapped with double walled bags. Two or three of these no. 3 cans are placed inside a stainless steel pressure vessel. This vessel is placed within a bird cage, of welded tubular steel, which serves as a crash frame. This frame is placed within a 55 gallon drum, lined with laminated plywood in the interior and sealed with an O-ring. The total weight of the drum package is 200 lbs., approximately.

The exact specifications of these containment structures are detailed in 49 CFR Parts 173 and 178 of the regulations of

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the Department of Transportation. Part 173.396 contains the regulations for fissile radioactive material. Regulation 173.396(c) (2) applies to solid radioactive materials which will not decompose at temperatures up to 250°F. Specification 6M, in part 178.104 applies to this package. Part 178.104-3 lists the general construction requirements. Paragraph (a) states that the outside drum must conform to specification 6C (Part 178.99) with minimum thickness of uncoated sheets equal to or greater than 16 gauge; Part 178.99-5 states that 16 gauge must have a nominal thickness of .0598 inches, with minimum thickness of .0533 inches and that the metal sheet must be low carbon, open hearth or electric steel. Paragraph (c) of Part 178.104-3 specifies, in addition, a plywood liner at least 1/2 inch in thickness. According to Part 178.104-3(b), the inner pressure containment vessel must conform to specification 2R of Part 178.34 which specifies a minimum wall thickness of 0.250 inches for vessels over 12 inches in height. (There is some confusion on this point because Part 178.34 specifies that if the inside diameter is not over 6 inches, the minimum wall thickness must be 0.125 inches.) The material (Part 178.34-1) must be stainless steel, malleable iron or brass. We note that the strength calculations on a pressure vessel with minimum wall thickness 0.139 inches indicates a yield strength of 24,000 psi ("Plutonium Oxide Shipping Packages", TID-4500, April 28, 1965, p. 6). We assume this yield strength in the following discussion.

Among other criteria both the pressure vessel and the drum must pass the puncture test listed in 10 CFR 71, Appendix B:

> "Puncture -- A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface. The bar shall be 6 inches in diameter, with the top horizontal and its edge rounded to a radius of not

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more than one-quarter inch and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface."

To summarize the requirements of Title 10 and 49 with respect to shipping containers for fissile radioactive materials, the metal thickness, that is, the sum of the metal thicknesses of the pressure vessel and outside drum must be 0.31 inches or 0.185 inches, with a plywood thickness at least 0.5 inches, and the containers must pass, individually, and together, the puncture test. See diagram Appendix A.

I believe that an air accident may result in a drop considerably in excess of a 40 inch drop on an unyielding punch. The AEC has investigated conditions which would puncture a shipping container. Appendix A. The experimental relationship between the energy of the falling container, the yield strength of the outer shell and the minimum outer shell thickness are given in Appendix A. If we assume the container has a yield strength of 24,000 psi, then we may determine the minimum shell thickness as a function of the drop height. If the cask drops 3,000 feet, the minimum shell thickness is 4.3 inches; if the container drops 300 feet, the minimum shell thickness is 0.83 inches. These numbers are considerably in excess of the actual metal thickness (.31 or .185 inches). The design specifications contained in the federal regulations do not approach the requirements of such crash elevations. I believe, therefore, that it is quite possible for this type of container to be punctured and the contents of one or more "tuna fish" cans to be released. This would especially be true if a fire ensued due to the combustion of polyethelene materials and the rapid expansion of heated air.

Having determined the shell thickness to be inadequate, what is left to prevent loss of the PuO_2? Analysis of the specifications for the LLD-1 shipping container indicates that in

addition to the outside steel drum and the internal pressure carrying vessel described above, there are the following container components:

1. Laminated Plywood.
2. Birdcage and thimble.
3. Polyethylene bags.
4. Tuna fish cans.

Taking each one of these in order the laminated plywood will absorb shock, provide puncture resistance and, for a short period, insulate the inner area from the heat of a fire. The birdcage will absorb deceleration shock only and a "thimble" or cap holds the cannister in the birdcage. The polyethelyene offers no resistance whatsoever. The tuna fish cans do not offer any significant resistance to crash impact.

I have only considered release of PuO_2 from a puncture mode mechanism. Among others there obviously may be a significant failure mode initiated by a crushing action occasioned by the additional weight of an airplane engine or other piece of cargo smashing the cask in a crash. My preliminary analysis of this type of failure indicates that the plywood and inner container would represent the only significant resistance to release of PuO_2. The crush resistance of the plywood case is unknown. However, the crushing or mere deformation of the inner pressure container would pop off the threaded plug and the tuna fish cans. The polyethylene bag, which would be the last line of containment would burn in any ensuing fire.

For the purposes of the analysis to follow, I assume one can is punctured. One can contains approximately 2.5 kg PuO_2, or about 2.05×10^4 Ci (20,000 Ci) (see section, "Toxicity of Plutonium").* I assume a release of 10,000 Ci, one-half of one

*Ci -- curies.

can, or 2.8% of a representative shipment.* It is quite possible that no PuO_2 is released in an accident. On the other hand, it is possible that much more is released.

II. SPREAD OF THE PLUTONIUM CLOUD

I calculate the total number of curies breathed by the population in this section. In the following section, I relate this plutonium uptake to tissue damage in rems, and use the BEIR report** to predict the number of lung cancer deaths.

To determine the total curie uptake, it is necessary to determine the concentration in Ci/m^3. Then, assuming an average breathing rate, it is possible to determine the number of curies uptake per person, at a particular location downstream. Using the population distribution of New York City and assuming a credible accident at J.F.K. International Airport, we can add up the total curie uptake.

To determine the concentration at particular locations of New York, I use straight-forward diffusion expressions from "Meteorology and Atomic Energy, 1968", US AEC, D.H. Slade, Editor. To use Pasquill's model it is necessary to make certain assumptions about the meteorology at the site. I consider three separate cases:

Case A is the most unlikely possibility, but produces the maximum plutonium uptake. In this case, I assume the plutonium is mixed homogenously throughout an area of 100 square miles of New York City, to a height of one kilometer, and that it settles down in a period of a few days.

Case B is Pasquill stability category F, moderately stable, with a wind speed of 1 meter/sec. This is not the typical weather condition at Kennedy Airport.

*Shipment of July 29, 1974, received at J.F.K. International Airport.

**See p. 9, infra.

Case C is Pasquill stability category C, slightly unstable, with a wind speed of 6 meters/sec (13.4 mph). The average wind speed at Kennedy Airport is 12.2 mph, which is close to 6 m/sec.

In both case B and C, I assume there are 30,000 people at Kennedy Airport itself, and separately calculate the Ci uptake to this special class. These calculations have been relegated to Appendix B, and are presented in Tables. Case A is explained here:

A condition such as Case A could occur if the cargo plane crashes on a very windy day. The minute particles would be thoroughly distributed throughout the area and could settle out during calmer weather. This condition could also occur if the cargo plane is involved in a low level mid-air collision which releases the powdered plutonium over the metropolitan area.

The total volume of air in a 100 square mile area, height 1 km, is 2.56×10^{11} m^3. The deposition velocity, for particles of 1 micron size, the representative size for the February 24, 1975 plutonium shipment, is greater than the terminal velocity by the Stokes formula, 0.4×10^{-3} m/sec (UCRL-14702, L Fisher, March, 1966). I take the deposition velocity as 10^{-3} m/sec. The particles fall to the ground in $1/2 \times 10^6$ sec, or about 5.8 days. I take the breathing rate as 3.5×10^{-4} m^3/sec (ICRP, no. 2). The total volume breathed during this period is 1.75×10^2 m^3. The plutonium concentration is 10^4 Ci divided by the total volume of air, or 3.9×10^{-8} Ci/m^3. The total Ci uptake per person is therefore $(3.9 \times 10^{-8}$ Ci/$m^3) \times (1.75 \times 10^2 m^3)$ or 6.8×10^{-6} Ci. Assuming 8×10^6 persons in New York City, the total Ci uptake is 54.6 Ci.

For Case B, with a wind speed of 1 m/sec, the toal Ci uptake of plutonium is 24.2 Ci, when the wind is blowing in a northwesterly direction into Manhattan, a likely wind condition.

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As seen from Fig. 1, the plume is narrow, and does not disperse greatly in the y (or z) direction. I assumed a deposition factor for this case. The airport population, 30,000 persons, has a plutonium uptake of 61.2 Ci. As is seen in the next section, all persons at the airport will die of lung cancer under Case B. For other deaths see Appendix.

For Case C, with a wind speed of 6 m/sec, the total Ci uptake is surprisingly low, .521 Ci, for a wind direction NW. This wind speed is the most representative for Kennedy Airport. Fig. 2 shows a much greater plume spread. The concentrations (ground) differ from Case B by two orders of magnitude, but the population within the plume is, of course, greater. This wind speed, and stability category, implies spread of the plume over a large area, but not necessarily where the population density is as great as in NYC. The airport population of 30,000 persons, has a plutonium uptake of only 0.[illegible] Ci due to these meteorological effects. For other deaths see Appendix.

III. NUMBER OF LUNG CANCERS

In the previous section, I calculated the total plutonium uptake of the population. In this section, I translate this number into the total biological damage to lungs caused, in terms of rems. Then, with a figure for person-rems, I use standard BEIR conversion factors to estimate the number of lung cancer deaths.

Different radionuclides have different biological effects on the lungs, and models exist to predict lung tissue damage. Both the AEC and the EPA use the ICRP model (ICRP no. 6, Pergamon Press 1964). Sustained exposure to 1 pCi/m^3 of Pu-239 in insoluble form leads to a dose rate of 12 rem per year in the pulmonary region. The relative conversion figure for Pu-238 and Pu-240 is one, and for Pu-241 is 10^{-3} (p. C-11, "Environmental Analysis of the Uranium Fuel Cycle", Part III - Nuclear Fuel Reprocessing, EPA-520/9-73-003-D, Environmental Protection Agency,

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Oct., 1973). I assume an average person breathes 7300 m^3/yr (ICRP No. 2, Pergamon Press, 1959). Thus, the dose from Pu-239 is 1.65 rem per microcurie.

The particular isotopic mixture chosen, and its effect on lung tissue is calculated in Appendix B Table 1. The final dose to the pulmonary region of the lung is 39.1 rems per microcurie. Without any explanation, yet using the same lung model, the AEC figures (WASH-1535, Table II.G-10) lead to a dose of only 22.2 rems per microcurie. This would seem to be in error, and I accordingly use 39.1 rems/microcurie.

The value for the expected number of lung cancers from a total dose in person-rems comes from the BEIR report ("The Effects on Populations of Exposure to Low Levels of Ionizing Radiation", National Academy of Sciences, National Research Council, Nov., 1972). These numbers are reported in WASH-1535 (Table II.G-24) as a relative lung cancer risk of 110 lung cancer deaths/10^6 person-rems, and an absolute lung cancer risk of 16 lung cancer deaths/10^6 person-rems. The EPA uses a figure of 50 lung cancer deaths/10^6 person-rems (p. C-18, EPA-520/9-73-003-D), which is the figure I use here.

The total number of cancer deaths, under the 3 meteorological assumptions is presented in Table 2. For Cases A, B, C, the total number of deaths due to lung cancer are 105,000 deaths, 76,700 deaths and 2,489 deaths, respectively.

These calculations assume that the persons take no evasive actions, and remain in the region for the entire period that the cloud passes. However, on the other hand, I have assumed only a 10,000 Ci release, a small fraction of the original 500,000 Ci inventory, and I have included no effects due to resuspension of the Pu dust, which may be the most serious of possibilities. Unless the city's ventilation filters, buildings, and streets were thoroughly washed down, the

plutonium dust would continue to be present in the air for quite some time until it was blown or tracked elsewhere. These calculations for cases B and C underestimate the number of lung cancer deaths for two reasons. The calculations were cut off at 100 km from Kennedy Airport. This is not serious for type F stability since the material is being deposited. However, for type C stability at 6 m/sec, the material blows out of New York City and into New Jersey and in the direction of Binghamton on a NW wind. The second reason for an underestimate is that no effects were considered at distances further off the center axis of the plume where the concentration had decreased to 1% of the center line concentration.

CONCLUSION

My conclusion is that significant hazard does exist due to plutonium shipments by air transport. Based on what I consider to be underestimates, I would expect the number of deaths to range from thousands to over a hundred thousand due to a 2.8% release of a representative shipment. I consider a 2.8% release credible in an air accident.

Marvin Resnikoff
MARVIN RESNIKOFF

Sworn to before me this
25th day of April, 1975

Audrey Kosielniak
Notary Public

AUDREY KOSCIELNIAK
Notary Public, State of New York
Qualified in Erie County
My Commission Expires March 30, 19 76

APPENDIX A. MINIMUM SHELL THICKNESS FOR PUNCTURE

The AEC has experimentally determined the relationship between the energy of a falling cask, the ultimate tensile strength, and the minimum outer shell thickness of a cask (L.B. Shappert, Cask Designers Guide, ORNL-NSIC-68, Feb., 1970, p. 20):

$$E/S = 39\ t^{1.4} \qquad (A.1)$$

where E is the energy in inch-lb, S is the ultimate tensile strength of the outer shell, psi, and t is the minimum shell thickness, in. The energy is W x h, the weight of the cask times the height of fall, in inch-lb. S is taken as 24,000 psi, and the weight of the cask is 200 lb. If h is 3,000 ft., then E is 7.2 x 10^6 in-lb; if h is 300 feet, then E is 7.2 x 10^5 in-lb. In the former case, t = 4.3 in., in the latter case of 300 foot drop, t = 0.83 in.

It should be emphasized that the AEC tests were conducted on an unyielding punch, which might not be the case here. On the other hand, the objects in a crashing plane may be sharper, and it is possible for much heavier objects, such as an airplane engine (5000 - 12000 lbs) to collide with energy, $W_{eng}xh$. The tensile strength of 24,000 psi is greater than that assumed in RPF-501, "Plutonium Oxide Shipping Packages", p. 6, where a tensile strength of 20,000 psi is assumed. For the specifications of these shipping containers, see Appendix C.

APPENDIX B. CALCULATION OF TOTAL CURIE UPTAKE OF PLUTONIUM DUST

In this appendix, I calculate the total curie uptake of plutonium dust. The calculations appear in Tables 4 and 6. The concentrations and spread of the plume are determined. The spread is taken at a distance perpendicular to the plume center line where the concentrations drop to 1% of the center line concentration. This is therefore an underestimate of the effects of a plutonium release.

In Tables 4 and 6, I calculate the uptake of plutonium per person at specified distances for the release point. I estimate the number of people living within a sector, and assume each person in the sector receives a dose equal to the center line dose. Since the concentrations drop off as in a "bell curve", this is an overestimate of the effect.

I estimate the numbers of people living under the footprint of plutonium contamination from a population concentration map obtained from the Tri-State Regional planning office.

TABLE 1. PLUTONIUM DOSE CONVERSION

Nuclide	wt. % (1)	Ci/g (2)	Weighted Ci/g x 10^{-2}	Fraction: Ci/g total Ci/g	Pu Conversion Factor (3)	Weighted Pu Conversion rems/mCi
Pu-238	0.596	16.9	1.01×10^{1}	1.23×10^{-2}	1.65×10^{3} rem/mCi	2.03×10^{1}
Pu-239	72.005	.0614	4.42	$.538 \times 10^{-2}$	1.65×10^{3}	$.89 \times 10^{1}$
Pu-240	18.692	.220	4.12	$.502 \times 10^{-2}$	1.65×10^{3}	$.828 \times 10^{1}$
Pu-241	7.005	113.8	8.025×10^{2}	.9775	1.65	$.161 \times 10^{1}$
Pu-242	1.655	.0039	6.46×10^{-3}			
			8.211 Ci/g		total	3.51×10^{1} rems/mCi

(1) shipment July 29, 1974, Kennedy airport

(2) from Tables 3.13, 3.15, ORNL-4451

(3) p. C-11, EPA, 620/9-73-003-D, assuming a breathing rate of 7,300 m^3/yr (ICRP, no. 2, 1959)

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TABLE 2. NUMBER OF CANCER DEATHS FROM 3% RELEASE

	Case A	Case B(1)	Case C (2)
NYC population	1.05×10^5	46.7×10^3	1.01×10^3
airport population		30×10^3	1.478×10^3
Total Deaths	105,000		
		76,700	2489

(1) Stability category F, wind speed 1 m/sec (2.24 mph)
(2) Stability category C, wind speed 6 m/sec (13.4 mph)

TABLE 3. CALCULATION OF PLUTONIUM CONCENTRATION

CASE B, F STABILITY, $\bar{u}$ = 1 m/sec

distance	χ/Q (1) $\left(\frac{sec}{m^3}\right)$	y distance for $\chi \times 10^{-2}$ (2)	deposition correction (3)	χ/Q corrected for deposition $\left(\frac{sec}{m^3}\right)$
100 m	3.54×10^{-2}	[illegible] m	0.97	3.43×10^{-2}
500 m	1.87×10^{-3}	[illegible].6	0.92	1.68×10^{-3}
1 km	5.83×10^{-4}	121.2	0.91	5.3×10^{-4}
5 km	6.24×10^{-5}	455	0.80	5.0×10^{-5}
10 km	2.44×10^{-5}	909	0.78	1.9×10^{-5}
50 km	3.82×10^{-6}	3.03×10^{3}	0.56	2.14×10^{-6}
100 km	1.86×10^{-6}	6.06×10^{3}	0.47	8.75×10^{-6}

(1) I use the expression $\chi/Q_x = (\pi \sigma_z \sigma_y \bar{u})^{-1}$

contained on p.381, "Meteorology and Atomic Energy, 1968", D. Slade, Atomic Energy Commission. The values for σ_z, σ_y are taken from Figures 3.10 and 3.11 of the same reference.

(2) The lateral distance y for a reduction of the center line plume concentration to 1% is given by the expression $y_p = (2 \ln(100/p))^{\frac{1}{2}}$, where p in this case is 1 (Eq.3.148, p.114, above reference).

(3) The correction for depletion from ground deposition is given by Eq. 8.4, p.381, above reference.

TABLE 4. CASE B, STABILITY CATEGORY F, CALCULATION OF LUNG CANCER DEATHS

distance	Ci uptake per person (1)	# persons (2) within area (not cumulative)	total Ci uptake by population (3)
100 m	1.2×10^{-1}		
500 m	5.88×10^{-3}		
1km	1.85×10^{-3}	30,000 (airport)	
5km	1.75×10^{-4}	1.3×10^{4}	2.28
10km	6.65×10^{-5}	6.7×10^{4}	4.35
50km	7.5×10^{-6}	1.26×10^{6}	9.45
100km	3.06×10^{-6}	2.65×10^{5}	8.11
			24.19

24.19 Ci uptake produces 46.7×10^{3} lung cancer deaths, assuming 39.1 rems/micro Ci, and 50 lung cancer deaths/10^{6} persons-rems

(1) The X values in Table 3 are densities, in units of sec/m^3. I multiply X by the initial release 10,000 Ci times the average breathing rate 3.5×10^{-4} m^3/sec.

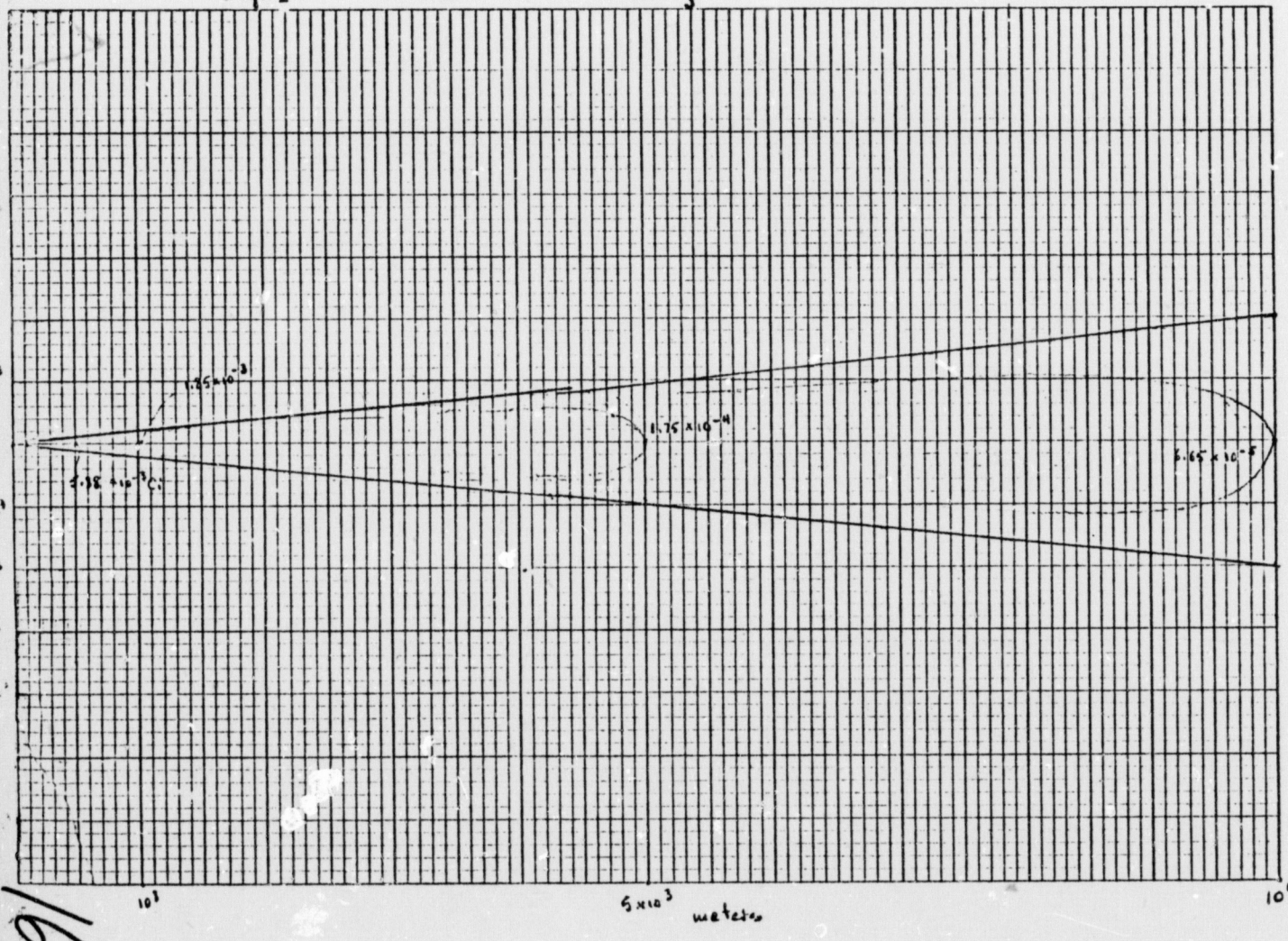
(2) This is an estimate of the number of people living within an isopleth given by the center line X values, but subtracting out those people already counted in the isopleth of greater concentration. The areas are given by Fig. 3, and the population distribution is taken from population data.

(3) The airport uptake is handled separately. All persons at the airport are expected to die of lung cancer in Case B.

Summary	Cancer Deaths	Location
Case B	46,700	Outside Airport
	30,000	Inside Airport
Total	76,700	Deaths


CASE B BASED ON 1970 CENSUS
VALUES: IN TENS, ONE INCH= 4 MILE
MANHATTAN AND
WESTERN LONG ISLAND
K

Fig. 2 Case B' F Stability



K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

TABLE 5. CALCULATION OF PLUTONIUM CONCENTRATION
CASE G, C STABILITY, $\bar{u}$ = 6m/sec

distance	χ/Q (1) (sec/m³)	y distance for $\chi \times 10^{-2}$ (2)
100 m	7.02 x 10^{-4}	37.9 m
500 m	[illegible] x 10^{-5}	182 m
1 km	[illegible] x 10^{-6}	303 m
5 km	[illegible] x 10^{-7}	1.365 x 10^{3} m
10 km	[illegible] 10^{-7}	2.58 x 10^{3} m
50 km	[illegible] x 10^{-8}	9.87 x 10^{3} m
100 km	4.42 x 10^{-9}	1.82 x 10^{4} m

(1) See Footnote (1), Table 3. No deposition correction factor is taken for this case since it is about unity.

(2) See Footnote (2), Table 3.

TABLE 8. CASE C, STABILITY CATEGORY C, CALCULATION OF LUNG CANCER DEATHS

distance	Ci uptake per person (1)	# persons within area (not cumulative) (2)	total Ci uptake by population (3)
100 m	2.46×10^{-3}		
500 m	8.85×10^{-5}		
1 km	2.52×10^{-5}	30,000 (airport)	
5 km	1.76×10^{-6}	4×10^{4}	7.04×10^{-2}
10 km	5.32×10^{-7}	2.26×10^{5}	12.0×10^{-2}
50 km	4.83×10^{-8}	4.34×10^{6}	21.0×10^{-2}
100 km	1.55×10^{-8}	7.8×10^{6}	12.1×10^{-2}
			0.521

0.521 Ci uptake produces 1.01×10^{3} lung cancer deaths, assuming 39.1 rems/microCi, and 50 lung cancer deaths/10^{6} person rems

(1) The χ values in Table 3 are densities, in units of sec/m^3. I multiply χ by the initial release 10,000 Ci times the average breathing rate 3.5×10^{-4} m^3/sec.

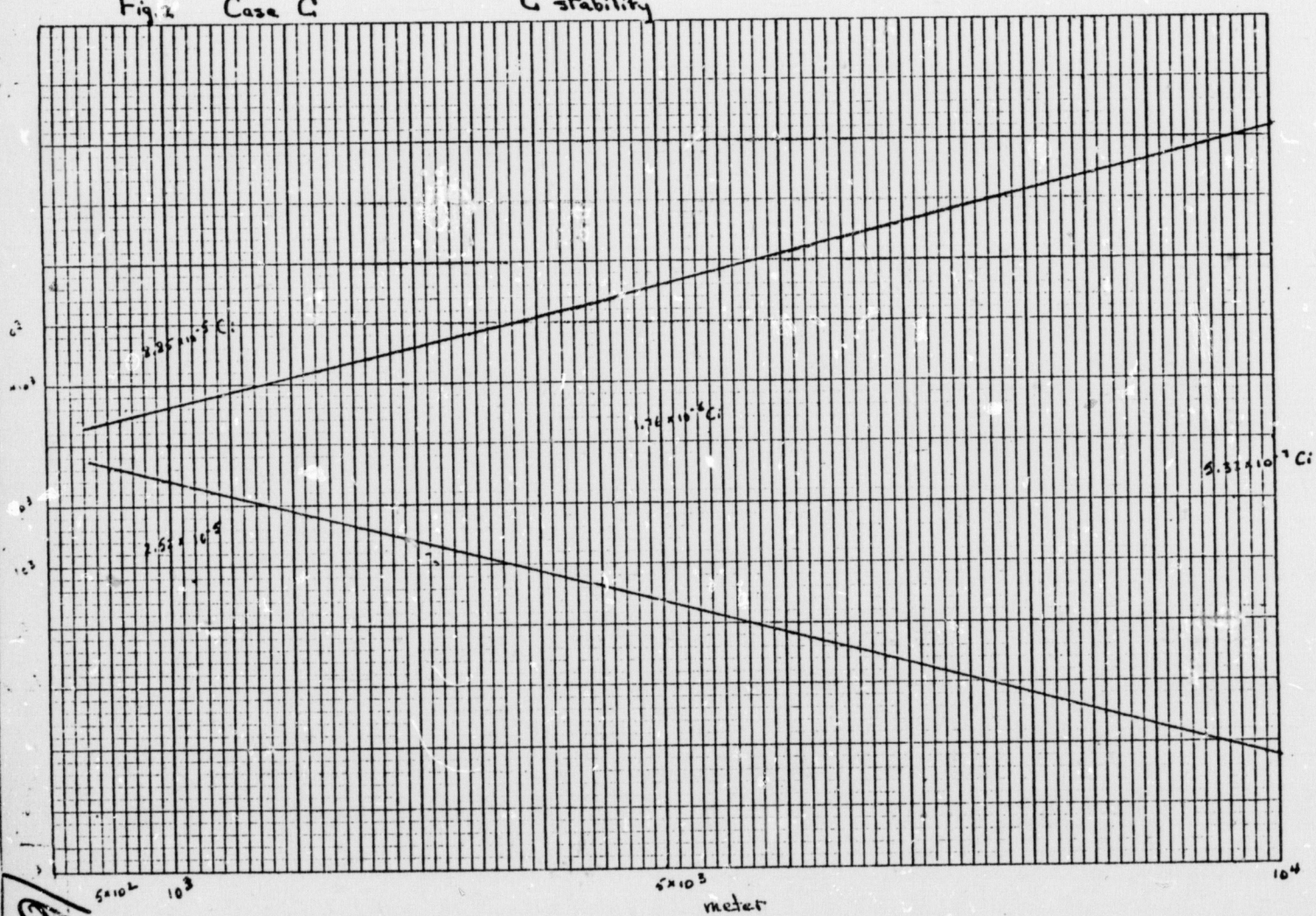
(2) See note (2), Table 4.

(3) The airport uptake is handled separately. The number of lung cancers in Case C is 1478 at the airport, out of 30,000 persons at the airport.

Summary	Cancer Deaths	Location
Case C	1011	Outside Airport
	1478	Inside Airport
Total	2489	Deaths

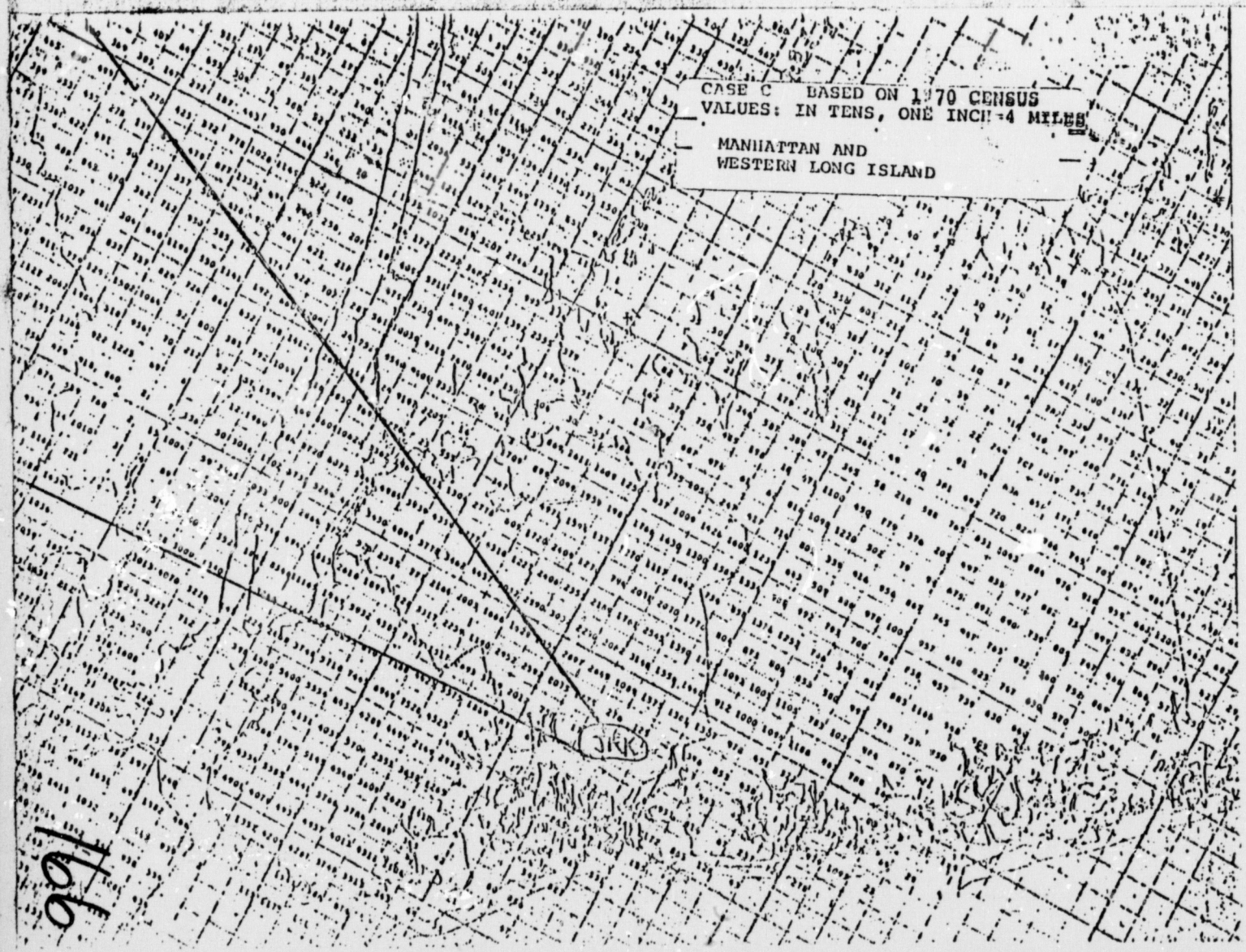
Fig. 2 Case C

C stability



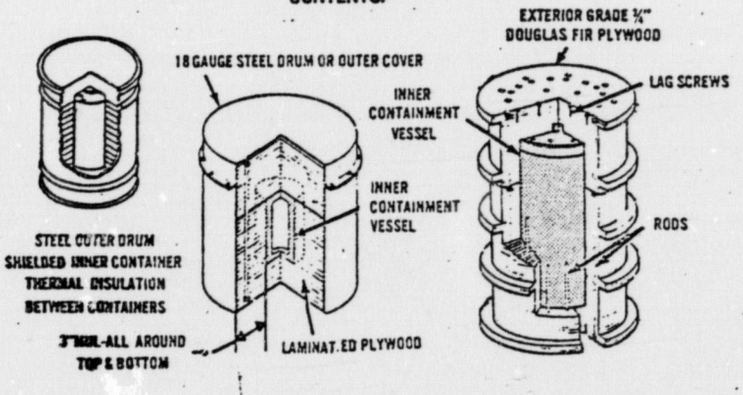
46 0780

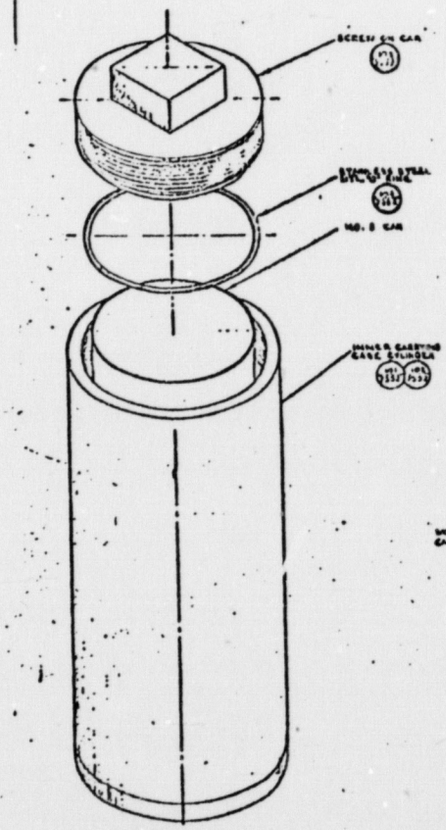
KEUFFEL & ESSER CO. MADE IN U.S.A.


CASE C BASED ON 1970 CENSUS
VALUES: IN TENS, ONE INCH=4 MILES
MANHATTAN AND
WESTERN LONG ISLAND

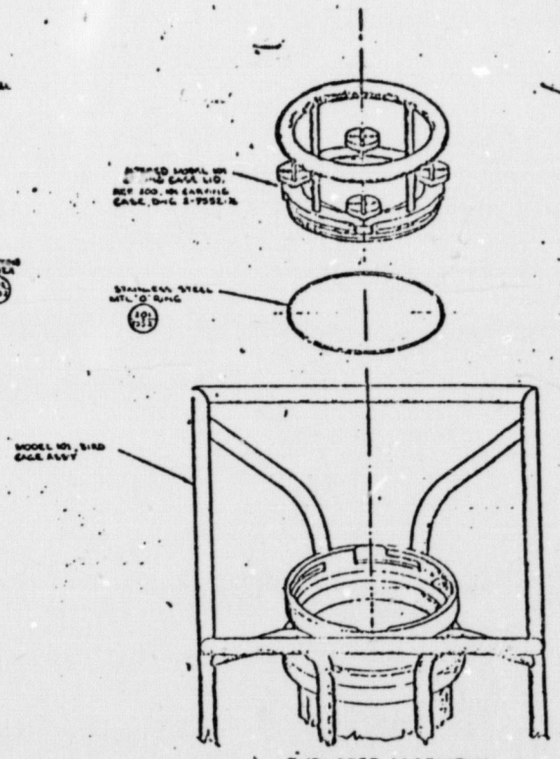
TYPICAL TYPE B PACKAGING SCHEMES

PACKAGE MUST STAND BOTH NORMAL [173.398(B)] AND ACCIDENT [173.398(C)] TEST CONDITIONS WITHOUT LOSS OF CONTENTS.

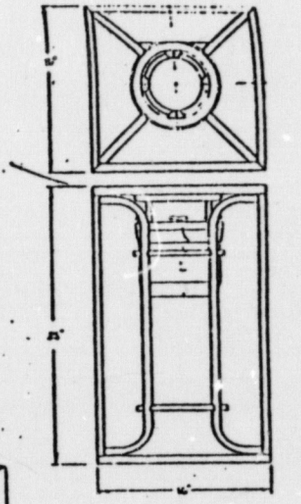




EXPLODED ASSEMBLY
FIGURE 1

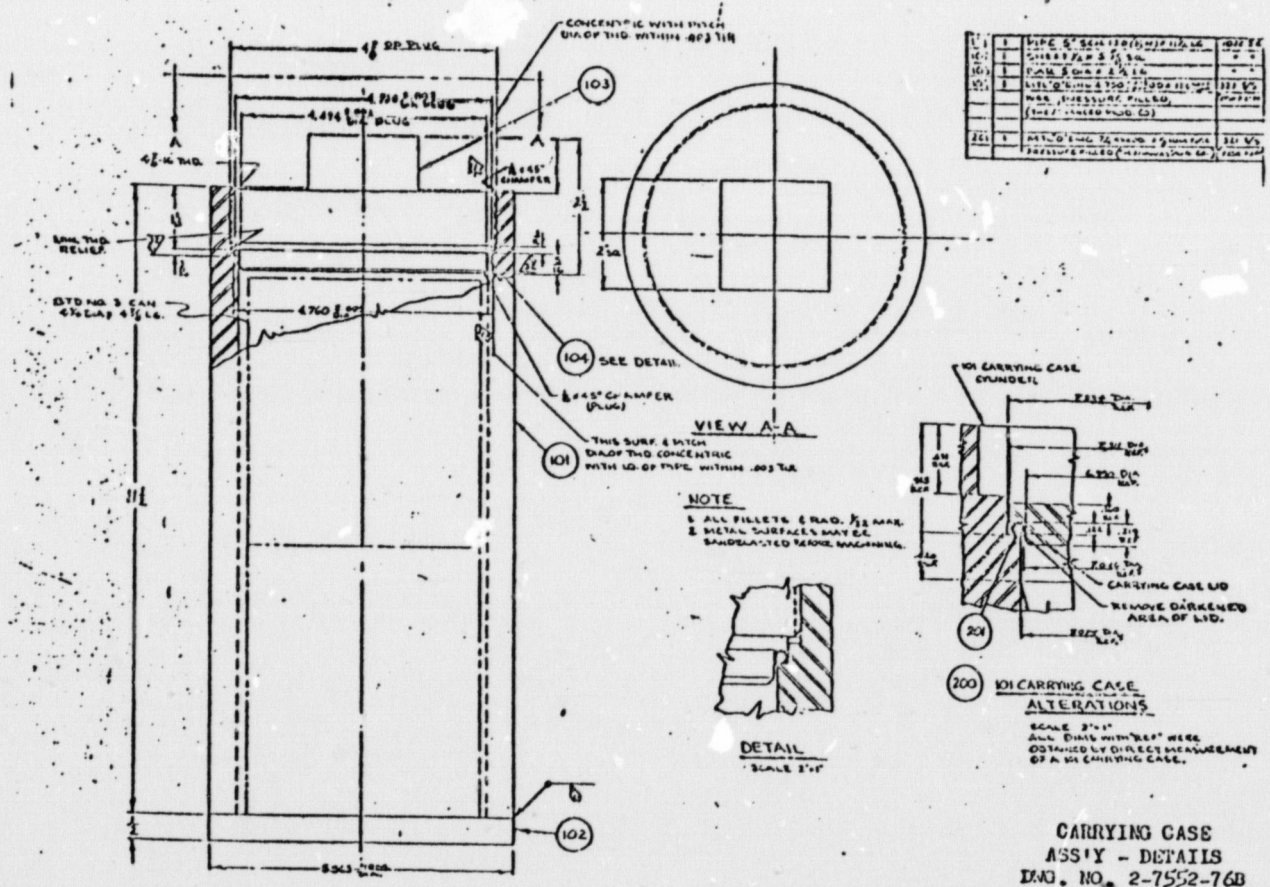


EXPLODED ASSEMBLY
FIGURE 2



REF. DETAIL OF ASSY
SHOWING OVERALL DIMS.

CARRYING CASE
PICTORIAL
DWG. NO. 1-7715-76



CARRYING CASE
ASS'Y - DETAILS
DWG. NO. 2-7552-76B

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CURRICULUM VITAE

MARVIN RESNIKOFF
174 West Ave.
Buffalo, N.Y. 14201
(716) 856-6587

PERSONAL: Date of birth, June 5, 1938; single

EDUCATION:
PhD, Physics, U Michigan, Ann Arbor, Mich., 5/65
M.S., Physics, U Michigan, Ann Arbor, Mich., 2/61
B.A., Phy/Math, U Michigan, Ann Arbor, Mich., 6/59

EXPERIENCE:

9/74-	Part-time lecturer, Rachel Carson College, State University of New York at Buffalo
2/73-1/74	Fulbright lecturer at Universidad de Chile, Santiago (terminated 10/73 due to military coup)
2/67-1/73	Assistant Professor of Physics, State University of New York at Buffalo
Summer 68/69	Director, Neighborhood Science Centers, Board of Education, City of Buffalo New York Research Foundation Fellowship Invited lecturer, Summer Theoretical Physics Institute, Boulder, Colorado,'68
9/65-8/67	Research Associate, University of Maryland
Summer 65	National Science Foundation participant, Latin-American School of Physics, Mexico City
8/63-5/65	Research Assistant, University of Michigan

GRANTS: National Science Foundation grant for Research in Elementary Particle Physics, with M. Ram, 6/69-6/71, $34,500. Renewed from 6/71-1/73 for an additional $20,000.

COURSES TAUGHT:

67-68	Phys 501-2	Intro. to Mathematical physics
	Phys 521R	Adv. Topics in Elem. Particle Physics
68-69	Phys 501-2	Intro. to Mathematical physics
	College A	Non-Authoritarian Community Schools
69-70	Phys 107R	General Physics
	Phys 608	High Energy Physics
	College F	Consciousness and Society
69-71	EPIS	Remedial Math Courses
70-71	Phys 307-8	Mechanics
71-72	Phys 103	Physics for Poets
	Phys 307-8	Mechanics
72-73	Phys 103	Physics for Poets
74-75	RCC 404	Environmental Action
	RCC 254	Electric Utilities and the Consumer

Curriculum Vitae — Marvin Resnikoff

COMMITTEES

Departmental — Physics

67-68	Colloquium Committee, Chairman
68-69	Graduate Student Committee Interdisciplinary Program Committee Search Committee for Physics Chairman, Member
69-70	Graduate Student Committee, Chairman Interdisciplinary Committee in Mathematical Physics Academic Affairs Committee, Physics Advisor
70-71	Comprehensive and Preliminary Graduate Advisory, Physics Advisor Academic Affairs Interdisciplinary Program in Mathematical Physics
71-72	Diagnostic Examination Session Interdisciplinary Program in Mathematical Physics Physics Advisor

Faculty Wide — 74-75 Steering Committee, Rachel Carson College

68-69	Financial Aid, Committee of Graduate School
70-71	FNSM Committee for Minority Faculty and Staff, Chm

University

67-68	Curriculum Committee, EPIS
69-70	Faculty Senate Advisory Committee on EPIS
69-71	EPIS Remedial Math Program, Chm
70-71 71-72	University Wide Committee for Minority Staff Recruitment

15. List of Publications

Marvin Resnikoff

"The General Coupling Coefficients for the Group SU(3)", J. Math. Phys. 8, 63 (1967).

"The Recoupling Coefficients for the Group SU(3)", J. Math. Phys. 8, 79 (1967).

"A Few Comments on the Representations of SU(3)", Rev. Mexicana de Fisica 15, 255 (1966).

"A Useful Relation Among Casimir Operators", Phys. Letters 19, 596 (1966).

"Mass Formulas for the 405 Multiplet of SU(6)", with RR Silbar, Phys. Rev. 148, 1341 (1966).

"Are the Positive Parity Mesons in the 405 Multiplet?", with RR Silbar, Phys. Rev. 149, 1245 (1966).

"The U(n)⊃R(n) Problem. I.", Nucl. Phys. 83, 632 (1966).

"Matrix Products and the Explicit 3,6,9,12-j Coefficients of the Regular Representation of SU(n)", with I. Kaplan, J. Math. Phys. 8, 2194 (1967).

"A General Class of SU(3) Recoupling Coefficients", U of Maryland Technical Report No. 676, May 1967. Not for publication.

"The Symmetric Quark Model of Baryon Resonances", with O. W. Greenberg, Phys. Rev. 163, 1844 (1967).

"Analyticity Requirement for Regge Poles and Backward Unequal-Mass Scattering", with Y.S. Kim, Phys. Rev. 169, 1288 (1968).

"Applications of the Poincare Group", U of Maryland Technical Report No. 706, July, 1967. Review talks presented at Faculty Seminar.

"On the Representation Theory of the Inhomogeneous Lorentz Group as a Foundation of Quantum-Mechanical Kinematics", by Hans Joos, Fortschritte der Physik 10, 65-146 (1962). Translated and circulated as an unpublished monograph.

"The Representations of U(4)⊃U(2)⊗U(2)", with M. Brunet, J. Math. Phys. 11, 1474 (1970).

"Branching Rules for U(n)⊃SO(n)", with M. Brunet, J. Math.Phys. 11, 1471 (1970).

"The Representations of U(4)⊃U(2)⊗U(2) and the Nuclear Quasi-Spin Model". Talk presented at the Summer Theoretical Physics Institute, Univ. of Colorado, Boulder, Colorado. Published in the Proceedings, Vol. XID, Mathematical Physics (Gordon & Breach Science Publishers, Inc.)(1970).

15. List of Publications (cont.) Marvin Resnikoff

"Degeneracy of the SU(3) Direct Product and the Symmetric Representations of $SU(6) \supset SU(3) \otimes SU(2)$", J. Math. Phys. 11, 1885 (1970).

"The Representations of $U(n) \supset SO(n)$", SUNY at Buffalo preprint, May, 1969, with M. Brunet. Resubmitted to J. Math. Phys.

"Extension of the Mass Operator in the Symmetric Quark Model for Negative Parity Baryon Resonances", SUNY at Buffalo preprint, June, 1970. Accepted for publication in Phys. Rev.

"The Bethe-Salpeter Equation in the Lorentz metric", unpublished.

Environmental Research

"Comments on Generic Environmental Statement on Mixed Oxide Fuels", critique of AEC's GESMO, October, 1974.

"Krypton-85 Concentrations-Revised Calculations" (In preparation).

"Is Reprocessing Cost-Justified?", Rachel Carson College preprint, submitted for publication.

"Comments on WASH-1535, LMFBR Program", joint N.R.D.C.-Sierra Club comments, April, 1975

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

----------X

THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and VERNON B. ACREE as Commissioner and FRED R. BOYETT as Regional Commissioner,

Defendants.

----------X

75 Civ

ORDER TO SHOW CAUSE AND TEMPORARY RESTRAINING ORDER

Upon the summons, the complaint verified May 5, 1975, the motion for a temporary restraining order and preliminary injunction contained in the affidavit of John F. Shea, III, Esq., sworn to May 1, 1975, the supplemental affidavit of John F. Shea, III, Esq., sworn to May 2, 1975, the certificate of John F. Shea, III, Esq., sworn to May 6th, 1975, the affidavit of Peter N. Skinner, sworn to April 29 1975, the supplemental affidavit of Peter N. Skinner, sworn to May 2, 1975, and the affidavit of Marvin Resnikoff, sworn to April 25, 1975, all in support of the motions, and after hearing John F. Shea, III, Esq., representing the plaintiff, in support of the motion for a temporary restraining order and Charles Franklin Richter Esq., Assistant United States Attorney, representing the defendants, in opposition thereto, it is

ORDERED that the defendants show cause before the United States District Court for the Southern District of New York on the 22d day of May, 1975, at 10 00 A.M. or as soon

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thereafter as counsel may be heard, in room 3703, at the United States Courthouse, Foley Square, New York, New York, why an order should not be entered pursuant to Rule 65(a) of the Federal Rules of Civil Procedure, preliminarily enjoining, annulling and setting aside, pending the final determination of this action, all present and future licenses, approvals and other actions of defendants, their agents, servants, employees, attorneys, and all persons in active concert and participation with them which, directly or indirectly, permit or execute the transport by air and related connecting transport of plutonium and other special nuclear materials to, from, in, and over the City and State of New York and the United States and its territories; directing defendants to forthwith instruct nuclear materials shippers, air and other carriers, and other persons or entities procuring or executing such transport that this preliminary injunction is in effect; and granting such other and further relief to the plaintiff as the Court may consider just and proper; and

~~It appearing that plaintiff has a substantial likelihood~~ of ultimate success on the merits; that plutonium or other special nuclear materials will be transported by air and related connecting transport to, from, in, or over the City and State of New York and the United States and its territories as a result of the actions of defendants, unless defendants' actions are temporarily restrained, annulled and set aside; that immediate and irreparable harm to plaintiff will possibly result if defendants' action are not temporarily restrained, annulled and ~~set aside and~~ that no security is required; ~~it is further~~

~~ORDERED that all present and future licenses, approvals~~ and other actions of defendants, their agents, servants, employees, attorneys, and all persons in active concert and participation with them which, directly or indirectly, permit ~~or execute the transport by air and related~~ connecting transport

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~~of plutonium and other special nuclear materials to, from, in,~~ and over the City and State of New York and the United States and its territories are temporarily restrained, annulled and set aside pending the determination of plaintiff's motion for a preliminary injunction and that defendants shall forthwith instruct nuclear materials shippers, air and other carriers, and other persons or entities procuring or executing such transport that this temporary restraining order is in effect; and it is further

ORDERED that service of a copy of this order, together with the papers upon which this order was granted, upon the United States Attorney for the Southern District of New York on or before May 7, 1975, by 5:00 P.M. shall be sufficient service on the defendants.

Dated: New York, New York
May 6, 1975

s/William C Conner
U. S. D. J.

Issued 6:45 PM

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JQjw

UNITED STATES DISTRICT COURT

SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,

Plaintiff,

-against-

The Nuclear Regulatory Commission, and WILLIAM ANDERS as Chairman; the Energy Research and Development Administration and DR. ROBERT C. SEAMANS as the Administrator; the Department of Transportation, and WILLIAM T. COLEMAN as Secretary of Transportation; the Department of State and HENRY A. KISSINGER as Secretary of State; the Civil Aeronautics Board and ROBERT D. TIMM as the Chairman; the Federal Aviation Administration and ALEXANDER P. BUTTERFIELD as the Chairman; the United States Customs Service and VERNON B. ACREE as Commissioner and FRED R. BOYETT as Regional Commissioner,

Defendants.

75 Civ 212 (WCC)

May 7, 1975
5:00 P.M.

B E F O R E :

HON. WILLIAM C. CONNER,

District Judge.

qjw

A P P E A R A N C E S :

JOHN F. SHEA, III, ESQ.
JOSEPH ZEDROSSER, ESQ.,
Attorneys for Plaintiff

CHARLES FRANKLIN RICHTER, ESQ.
NATHANIEL L. GERBER, ESQ.,
Attorneys for Defendants

ALSO PRESENT:

GUY CUNNINGHAM, ESQ.,
Nuclear Regulatory Commission

o0o

THE COURT: Who is here representing the defendants?

MR. RICHTER: Charles Franklin Richter, Assistant United States Attorney. Nathaniel Gerber, Assistant United States Attorney.

Also present is Mr. Guy Cunningham who is an attorney with the Nuclear Regulatory Commission.

THE COURT: Have you had an opportunity to study the papers?

MR. RICHTER: We have had an opportunity to study the papers and make initial inquiry to be prepared to respond to the papers at this time.

Obviously because of the mass of the papers

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qjw

we have not had the opportunity to explore every detail contained in the papers but we can give your Honor a concept of the government's position and also of the government's opposition to what is requested in these papers.

THE COURT: Let me ask you a couple of questions first.

There is a shipment from Kennedy Airport contemplated within the next week or so, isn't there?

MR. RICHTER: We checked on that. The licensee was called and that would be the person who would know and the licensee stated that no shipment is coming in through JFK, that is the specific shipment referred to on May 12th is not coming in through JFK. It is not even coming in through the State of New York. Rather it will be brought in by boat through the Port of Newark.

I should also say on that --

THE COURT: Is it true then that there is no shipment into or out of Kennedy of these special nuclear materials contemplated within the next several weeks?

MR. RICHTER: We are aware of no significant shipment of these materials.

THE COURT: There is no such thing as an insignificant shipment, is there?

MR. RICHTER: Yes. The significance is defined

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as over five kilograms of U-235 or over two kilograms of U-233 or plutonium. We know of no shipments in those amounts or greater than those amounts. We also know of no shipments in lesser amounts going through Kennedy.

However, we cannot, within the short period of time that we had, find out whether there are any shipments of lesser amounts coming in.

I was informed that in general if they are of lesser amounts they are usually in solid forms and they are usually for research purposes.

THE COURT: The affidavits refer to the very fine powder forms, something on the order of one micron size.

How frequent are shipments of the materials in those forms?

MR. RICHTER: Well, what I specifically asked about were shipments coming in through Kennedy and since I was told no significant amounts are coming in I did not proceed to ask how often shipments of powdered form of plutonium come in.

I was told as to lesser amounts under the significant amounts that again these are for research purposes and usually they are in solid form.

I do not know the answer as a general matter

qjw

how much of the shipments by air through the United States are of plutonium and powdered form. I should also add I was told that as far as domestic transportation of special nuclear materials go there are thousands of such shipments.

However, very, very few of them, I don't want to state categorically, but as I remembered I was told in one year, I believe it is the year 1974, there are only 15 of those shipments which were made by air and they were very small amounts.

So I think for all practical purposes domestic shipments in the United States are made by ground transportation.

THE COURT: We are only talking about the overseas shipments as a practical matter?

MR. RICHTER: Also I should point out when I read the papers I thought what the State was addressing itself to was primarily the export-import program of the United States and not concerned with the shipment of special nuclear materials everywhere in the United States.

I think I should also point out a couple of things in this regard why the government opposes the motion for a temporary restraining order of the State of New York.

qjw

First, again, we read the complaint to mean that it was limited to air transport and connecting land transport and that primarily means the export-import program conducted by the United States even if it's read more generally to mean air transport through the United States. Again, I have been informed that that happens very infrequently and it is of small amounts.

The Nuclear Regulatory Commission has already agreed prior to the commencement of the suit to prepare a NEPA statement concerning the transportation of special nuclear materials by means of air transport and connecting air transport and included in that NEPA statement will be consideration of problems of securing the safety of the items being shipped and I have for your Honor a copy of a letter which was sent on April 24, 1975 from the Nuclear Regulatory Commission to the Honorable James H. Scheuer who is a Congressman from the State of New York in which the Commission advised Mr. Scheuer that "In view of the expressed concerns for public safety the Commission intends to conduct a rule making proceeding that will cover transportation of special nuclear material including plutonium by air."

This letter again was sent April 24th before the commencement of the lawsuit.

I showed a copy of this letter to the attorneys for the plaintiff prior to this meeting. I have copies of similar letters sent to other officials.

THE COURT: This letter doesn't state when the NEPA statement will be completed.

MR. RICHTER: That is correct, your Honor. However, the prime element of the plaintiff lawsuit is to ask this Court to order the United States to prepare such a NEPA statement and the point is that we had already agreed to do that.

THE COURT: They want more than that. They want the shipments by air enjoined in the meantime.

MR. RICHTER: That is correct. I will address myself to that.

I think one key thing to get across is that we have already agreed to prepare the NEPA statement.

The second preliminary thing which should be mentioned is that there presently is a lawsuit pending in the District of Columbia which is Sierra Club versus United States Atomic Energy Commission, et al. That is Civil Action No. 1867-73, an action started in 1973 by the Sierra Club and in that action the Sierra Club asked for almost exactly what the plaintiffs ask for, that is they ask for a NEPA statement concerning the transportation.

In this action the plaintiff sought a declaration that NEPA applies to the nuclear power export program, that is the program in the United States whereby it enters into an agreement wit' foreign countries to supply nuclear materials to those countries and it also asks for an injunction banning the licensing and the shipment of these nuclear materials --

THE COURT: All shipments, whether by air or surface or however?

MR. RICHTER: Yes, your Honor.

THE COURT: That is somewhat broader.

MR. CUNNINGHAM: Internationally.

THE COURT: Only internationally?

MR. RICHTER: Yes, your Honor.

In connection with that action the government agreed to prepare such a NEPA statement and I have a copy of the memorandum order on that point.

THE COURT: Was there any motion for a temporary restraining order or a preliminary injunction?

MR. RICHTER: I am not aware of such a motion. There could have been but I am not aware of one.

THE COURT: When was that action filed?

MR. RICHTER: 1973. I did ask whether there were any decisions dealing with that point. I was told

qjw

that there were no such decisions. That was the only memorandum. It is also before Judge Gasch.

MR. CUNNINGHAM: If I may interject, there was a prayer for injunctive relief in the complaint. There was no further or specific motion. The Court did not address the point specifically.

MR. SHEA: Your Honor, I have spoken with counsel for Sierra Club in that case and I determined that the case addressed itself strictly to the issue of export of the United States nuclear technology including reactor parts and fuel for reactors.

An order was issued by the Court directing the NRC to issue an environmental impact statement on that point. The plaintiffs in that suit had to proceed to go back to the Court and get a secondary order, I believe, to bring out a mini NEPA statement which was to be issued after six months.

I believe the ultimate NEPA statement was to be issued after a year. To date there has still been no NEPA statement issued on that point.

THE COURT: When was the order issued?

MR. SHEA: I believe the plaintiffs had to go back to court again in January of this year and the six months had expired. I would like to point out that that

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suit does not address itself to ERDA shipments, the Energy Research and Development Administration shipments of special nuclear material by air nor does it address itself to the domestic shipments of special nuclear shipments by air nor does it address itself to the import of special nuclear materials by air.

As to the point of whether these materials are in significant or insignificant amounts, I don't believe that is a distinction we can concern ourselves with at great length because two kilograms of plutonium as demonstrated hopefully in the affidavits for plaintiff, two kilograms of plutonium is definitely a severe risk to the citizens of the state, it poses a severe risk.

THE COURT: That depends to some extent on its form. If it's in the fine powder form it is obviously a greater threat simply because of its fugacious nature.

MR. SHEA: In solid form, however, it still poses a danger, it is a dangerous material because of its attraction for terrorists for its diversion and manufacture into weapons.

MR. RICHTER: Can I address that point? The method of which it is determined whether it's a significant or insignificant amount is on that basis of whether it would be of interest for use in a nuclear weapon.

qjw

If it's less than the significant amount I have been told the terrorists would be wasting its time trying to get hold of the material. If it's above the significant amount it would be but then, as I said, there are different factors coming into play then.

MR. SHEA: We then get to the point of whether or not a terrorist will attempt to divert merely one canister or one shipment. You cannot -- it is virtually impossible to make a nuclear weapon with one kilogram of plutonium.

However, it has been stated that five kilograms of plutonium is sufficient. That would be two and a half shipments of insignificant amount of this nuclear material.

Plaintiffs are pleased to hear that NRC anticipates a NEPA statement. The primary thrust of our complaint was not to direct the NRC or the other defendants to issue a NEPA statement but rather to enjoin these actions of the defendants pending a sensible review of the alternatives to the air shipment of special nuclear materials.

We don't believe that to allow shipments to continue in the interim, and we don't know how long this interim period will be, we don't believe to allow these shipments to continue would be in the interest of the residents and citizens of the state.

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qjw

MR. RICHTER: I am prepared to address myself to that.

THE COURT: How often do shipments of the special nuclear materials go out of the New York area?

MR. RICHTER: Do you mean by air?

THE COURT: Yes, by air.

MR. RICHTER: To my knowledge as of the present time, there are no shipments going out by air, at least from JFK nor have I been informed of any others.

THE COURT: Over the last year or two how frequently have such shipments gone out?

MR. RICHTER: I do not know the answer to that, your Honor.

THE COURT: What I am trying to ascertain is whether or not there would be any significant harm to the government's interest if there were a temporary injunction against shipments going out of the New York area by air or going out of any populated area by air.

MR. RICHTER: There would be significant harm to the United States if that were to occur. In granting the temporary restraining order one factor as with the preliminary injunction is whether it would be in the public interest. It would definitely not be in the public interest.

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As I have stated before shipments by air are usually going overseas as part of the export program of the United States. They are pursuant to agreements entered into between the United States and foreign countries to supply nuclear materials, primarily for nuclear power facilities in foreign countries. Foreign countries rely upon the United States for these materials.

If these shipments were interrupted, even for a small period of time, it could have disasterous effects because then what could easily happen is that the foreign countries would fear that they could no longer rely upon the United States for these nuclear materials. The countries would then possibly go to developing their own facilities for producing these nuclear materials.

The United States would not have the ability to control the proliferation of nuclear weapons. If the United States were not the main supplier of these materials it would have a disasterous effect on the credibility of the United States and the ability of the United States to prevent the further proliferation of these materials.

That might sound like I am painting a very black picture but I think that is a definite consideration which has to be kept in mind and which, by the way --

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THE COURT: We are only talking about air shipments. Why can't these shipments take place by surface ship?

MR. RICHTER: Before a temporary restraining order is issued, I think the burden -- and the Second Circuit has held -- the burden would be on the plaintiff to show the necessity for that to occur.

In the plaintiff's papers they have come in with many allegations as to the danger which would occur if for example any plutonium dioxide got out. They have also talked about the danger of terrorists.

When it comes to specifics as to what is precisely the danger involved there is very, very little in their complaint as far as the possibility of accident. The only thing they say is that the regulations governing the type of containers which are required to be used for special nuclear materials could in an airplane accident under certain circumstances which I don't understand and I don't think are fully specified, could burst and there could be a release of these materials.

One thing I would like to point out to your Honor is that these regulations predate NEPA. They were prepared pursuant to public hearing. The State of New York had every opportunity to comment on them.

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The primary purpose of these regulations was to insure adequate packaging and safeguarding in packaging of special nuclear materials. To my knowledge the State of New York never objected at the time the regulations were prepared. Perhaps the attorney for the State can comment on that.

I was also informed today that the State of New York has identical regulations governing the packaging of special nuclear materials which are shipped interstate in the State of New York.

I find it hard to believe that they are now complaining about federal regulations since their state regulations are the same.

Again, what they are doing is coming in with hypotheticals without any specific showing that there is any danger. What they want us to do is now to interfere with our foreign commitments.

THE COURT: These foreign commitments can be handled by surface shipment, can't they? That is the question. All they are asking for is an injunction that would prevent you from making air shipments into or out of.

I don't know whether it's any U.S. Airport or only those in the New York area. I guess it's the ones in

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the New York area, the ones the State of New York is interested in.

MR. SHEA: We are concerned the NRC will not concern itself to the problem as a national problem. Naturally our immediate concern is for the safety of New York citizens. However, if you are starting to talk with Newark Airport there is not much -- to have a dispersal of these substances over New Jersey does not mean that the New York residents would be safe.

We are really talking about a national question here. If I could address some of the points raised by the U.S. Attorney.

We are not restricting or attempting to restrict the government -- we are not attempting to prevent the government from shipping these materials entirely. We are strictly addressing the issue of air transport of these materials.

I don't believe that this Court can properly weigh the health and lives of United States citizens against the energy needs of certain foreign countries when there is the possibility of immediate and irreparable injury to United States citizens.

The burden, unlike the way the United States Attorney sees it, is not on the plaintiffs to demonstrate

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that there is no harm with alternate modes of transportation. The plaintiff has tried to demonstrate that there is a significant risk of harm with the present choice of transportation.

I would like to submit a memorandum to the Court which in part addresses that point. It is not the burden under NEPA for a plaintiff in an environmental lawsuit to have to come into court and demonstrate to the Court that there are adequate alternatives to the proposed federal action.

A NEPA statement itself is supposed to address alternatives and to assess the impacts of alternatives. That is for the benefit of the public. That is not for the public to assume as a burden.

We have demonstrated in our affidavits in support of the motion that there is a significant possibility in aircraft crash environments that the canisters designed by the federal agencies can burst. I don't believe that we have to set forth in our affidavits specific aircraft crash scenarios or specific terrorist scenarios although we tried --

THE COURT: I think in talking of terrorist scenarios, you have to show that there is a substantially

greater chance of a terrorist getting hold of the materials if they are shipped by air than if they are shipped by ship or rail. Otherwise what good is it going to do me or going to do you for me to enjoin the shipment by air?

MR. SHEA: In that regard, although again we don't believe it is the State's burden to demonstrate alternative modes --

THE COURT: You have to show you are entitled to a temporary restraining order and you have to show me some reasons. One of the reasons you have relief on is the possibility that pilferage or hijacking could put the special nuclear materials into the hands of terrorists. That makes sense only if there is a greater chance of that happening on a shipment by air than there is on a surface ship.

MR. SHEA: In that regard, although we did not address it in the papers, we do believe there is a greater -- we believe the risk involved with terrorists attacks would be substantially reduced if alternate sites, more remote sites for the importation of these materials and exports of these materials were set up. Ideally military sites would be used for the receipt and dispatch of these materials. It seems absolutely ridiculous to

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handle these materials through an airport the size of John F. Kennedy International.

THE COURT: Would you have them handled instead through Sunnyside freightyards or through the waterfront in Brooklyn? I don't think that there is any less likelihood of pilferage on the waterfront or in the freightyard than there is at Kennedy.

MR. ZEDROSSER: If I may be heard just briefly. I think frankly this issue of whether we have shown that this is worse than the alternative is a rank red herring.

THE COURT: I threw it in so I am guilty.

MR. ZEDROSSER: I think the Assistant U.S. Attorney raised the issue. In the Izaak Walton case cited in our memo it's indicated that the harm in a NEPA case is the harm of federal action without having had environmental impact statements.

THE COURT: They have agreed to give you the NEPA statement. The only question we are discussing, and let's not waste time talking about anything else, is whether or not you are entitled to an injunction in the meantime. You are entitled for an injunction you say for two reasons. Number one is the likelihood of hijacking or pilferage. Unless there is a difference between the

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likelihood of hijacking or pilferage in case of shipments by air as compared to the case of surface shipments, that argument goes completely out the window and we are talking only about the danger of crashes.

MR. ZEDROSSER: I understand the Court's point. Frankly, the Walton case was a preliminary injunction case and even on a preliminary injunction, we submit, the harm is the harm that government action is being implemented without there having been a prior evaluation and an impact statement. That is what Walton says. That is what --

THE COURT: There is nothing we can do about creating a prior statement. They are in the course of preparing a statement. It may take six months, it may take another year. The only question that I want to hear any discussion at all about is whether they are going to be enjoined in the meantime. Anything else is totally moot.

MR. ZEDROSSER: We quite agree. In the Scherr case dealing with a preliminary injunction the Court said that the attempt to put the burden on the plaintiff of in effect writing the impact statement in advance in saying how the merits would come out in terms of this alternative or that alternative is something that won't be tolerated.

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This is an attempt by the government to in effect make the plaintiff write the NEPA statement so he can get the injunction. I think if the Court will look at the cases --

THE COURT: If that is what that case says I can't but believe that the facts there were different from those here. It seems to me logical that if you come in asking for an injunction you have got to show me that the injunction makes sense from a logical standpoint and the only way you have tried to show me that it makes sense is that air transportation involves a greater hazard of crashes and a greater hazard of hijacking or pilferage.

MR. SHEA: On that point I would say the mere fact that we have demonstrated that there is a chance of dispersal because of aircraft crash environments that that would be enough to show that the air transport of these materials is an unrealistic mode at this time.

Also I might repeat that there are alternatives such as the importation to military sites which if you are concerned about the point of terrorism it must be admitted by the government that you substantially reduce the element of danger in terms of terrorism when you import and dispatch these materials from military points.

THE COURT: I would think that if there is a

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basis of compromise it would be along those lines, that is that the government would agree that pending completion and issuance of the impact statement it would either transport these special nuclear materials overseas by surface transportation or would transport them by flights originating or terminating at military bases adjacent to the seaboard or near the seaboard adjacent to the point from which the air shipment originated or to which it is destined.

I don't think that is a serious impairment of the government's ability to transport the materials.

MR. RICHTER: Your Honor, I am prepared to address that point. If you have to go downstairs --

THE COURT: I have to go see what the jury wants. I will be right back in a moment.

(Recess)

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THE COURT: For the record, during the time the court reporter was absent we have been discussing a date for a hearing on the temporary injunction.

I have indicated my disposition not to sign a temporary restraining order because at this point I am not satisfied that a sufficient showing of irreparable harm has been made in the sense that I am not satisfied that there is a threatened shipment of special nuclear materials by air and that alternative methods of shipment would pose a substantially lesser threat than such contemplated shipment.

So that I think the most orderly procedure is to set an early date for an evidentiary hearing on the preliminary injunction and to consider such matters at that time. I understand that the government at this point is not in a position either to state when they would be prepared for such a hearing or how long such a hearing might take.

On the other hand, the Attorney General's office wants a specific date set as a target date rather than letting the matter go indefinitely.

I am willing to set down as a temporary date two weeks from Thursday on the assumption that there is a possibility that the evidentiary hearing might take no

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than one day. If it is going to take longer then I would think that it would be two weeks from next Monday.

Off the record.

(Discussion held off the record.)

THE COURT: If it turns out that the hearing will take more than one day then we'll have to set a subsequent date.

MR. ZEDROSSER: Your Honor, on the assumption that it would be no more than one day and therefore two weeks from Thursday, what would be the date by which we would expect the written response?

THE COURT: Well I should hope that the government would get their written response to you by Monday of that week so that you would have it 72 hours in advance of the hearing. Or approximately.

MR. RICHTER: As of this time, your Honor, the government has no objections to that.

MR. ZEDROSSER: Would it be possible to get it to us on Friday so we would have the weekend to spend in the happy pursuit of trying to analyze it?

THE COURT: Well, can the government get it by Friday of the preceding week?

MR. RICHTER: Off the record.

THE COURT: Off the record.

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(Discussion held off the record.)

THE COURT: I will say this, if you get your stuff to them by Friday of the preceding week then I will require that they get any papers they are going to file in response by Wednesday Noon. On the other hand, if you are not going to get your papers to them until Monday then I will allow them to serve answering papers up to 5:00 o'clock on Wednesday.

So if you want the extra half day get your papers by Friday.

Now, what do you want to do?

MR. RICHTER: Well, I take it you are giving us an option as to --

THE COURT: I am giving you an option.

MR. RICHTER: Well, we'll try to get our papers in by that Friday but again I am not in a position to know and we will be aware of the option.

THE COURT: But you have got ten days to get it in by Friday so let's set that as the time then and say that any answering papers will have to be in the hands of the defendants attorneys by 12:00 Noon on Wednesday the day before the hearing.

MR. ZEDROSSER: Your Honor, since we don't have any papers from them I think it may be useful in order

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to narrow what we are talking about to get a couple of things straight on the record.

One is that, as I understand this and please correct me if I am misstating it, that the purpose of this, that the representation about no flights into JFK deals with international flights, is that correct?

MR. RICHTER: My understanding is that NRC, the Nuclear Regulatory Commission is not aware of any flights either going into JFK or going out of JFK in which any significant amounts of special nuclear materials are involved.

MR. ZEDROSSER: During what period of time? How far in the future?

MR. RICHTER: They don't know of any upcoming flights. Either domestic or foreign.

MR. RICHTER: From JFK, yes, your Honor.

THE COURT: Or to JFK.

MR. RICHTER: Or to JFK. I was not -- I hesitate for a second on "to JFK". I asked about any flights out of JFK and specifically what was looked at was the export-import program. And in that regard they said that there were no flights, I think I would have been told if there were any other flights that they were aware of even just domestic flights containing any significant

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amounts.

I would also point out the letter which is attached to the plaintiff's papers in which there was a statement as to the fact that there wouldn't be any flights --

MR. ZEDROSSER: That's what is most disturbing, your Honor, about this whole business and frankly why I want to get some of this on the record.

After we got the letter which blandly says there are no such flights coming in we had a conversation with a gentleman, and this is in an affidavit by Mr. Shea, who is in the office in Pennsylvania that is somewhat closer to the actual monitoring of the shipments and he said in fact the then upcoming shipment had been reviewed by the NRC and was coming in.

Accordingly, I am a little bit concerned about these representations and --

MR. RICHTER: I would like to make a statement. First I think we are getting far afield. There is no need to get into that.

Secondly, the State's attempt to impune the integrity of the United States government or to question any representations which were being made are not taken in good faith and I find it objectionable and I will state--

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MR. ZEDROSSER: I would hope they would be taken --

MR. RICHTER: It seems to me the suit is largely a political suit you have come in with no specifics--

THE COURT: Well, now, don't let's have any counter-charges of bad faith.

MR. ZEDROSSER: Your Honor, it is a purely factual matter that I would like to resolve putting aside all of the coloration of this thing.

Is it true or not that you cannot make representations as to whether any domestic shipments are being made or going to be made either under license by NRC or by ERDA itself which does not require a license by NRC?

MR. RICHTER: If I can suggest to you why don't you just serve interrogatories on us? I don't understand the purpose --

THE COURT: Well, can you answer the question? Let's don't wait thirty days for answers to interrogatories.

MR. RICHTER: I am not sure what the question is.

THE COURT: Well, find out as quickly as you can and let him know.

MR. ZEDROSSER: Your Honor, the reason I am concerned is because the Court just stated it was not

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granting the TRO because it felt that nothing was going to be coming in. Merely because one international flight is now being changed into supposedly a -- going to Newark. There is much more in this suit if Mr. Richter would just look at our "wherefore" clause he will see that we're trying to deal with domestic flights, whether licensed by NRC or flights by ERDA which NRC doesn't even license and I want to find out what representations are being made on this record upon which the Court may rely.

And I look over this and it is rather fuzzy. I made notes of it, I looked at them and I want to know whether any representation, whatever, is being made as to domestic flights either licensed by NRC or domestic flights made by ERDA.

MR. RICHTER: I am making no representations as to that.

MR. ZEDRONSER: That's what I was afraid of.

MR. RICHTER: Because I do not know about specific flights. As I stated before I was told that there are very few domestic flights in the United States. And is the State prepared to represent that the State has not licensed any interstate flights containing these materials?

MR. ZEDRONSER: That's not the issue. The

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issue here is --

THE COURT: No --

MR. ZEDROSSER: Is an obligation by the federal government.

THE COURT: My understanding was that you have made an investigation and you have been informed that there are no contemplated flights of significant amounts of special nuclear materials into or out of Kennedy.

MR. RICHTER: That's correct, your Honor.

MR. ZEDROSSER: And your Honor that's all. There is nothing about Buffalo International which is in the State. There is nothing about Newark International which is close enough to the State to be a serious problem. There is nothing about domestic shipments including those by ERDA which NRC as far as I know doesn't even know about.

So as long as we are clear that the determination that nothing is coming in is made on the basis of that, we're clear. Obviously we don't feel that it is any assurance.

THE COURT: Well, I assume that you will make an investigation and you will inform Mr. Shea and Mr. Zedrosser if there are any contemplated flights of significant quantities of special nuclear materials into or out of any New York airports at any time between now and

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the time of our evidentiary hearing.

MR. RICHTER: Certainly, your Honor.

MR. ZEDROSSER: Your Honor, may we include in that so-called insignificant but nevertheless perhaps important amounts?

THE COURT: My understanding is that "significant" has been defined as anything that would be of interest to a terrorist.

MR. RICHTER: That is also my understanding.

MR. ZEDROSSER: But to an air accident presumably that would be quite irrelevant. And I would request --

THE COURT: Well, I assume that a terrorist would be interested in anything that would pose a substantial threat to the public. So for that purpose a significant amount for a crash purpose would be the same thing.

I am going to have to go, gentlemen. I have to release the jury at 6:45. I will get your papers at the times we have indicated and we will have our evidentiary hearing two weeks from Thursday.

MR. ZEDROSSER: If we may ask the Court to sign the order to show cause obviously without the TRO so that we do have an order to show cause we can serve these

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gentlemen with it and it may be filed. We are also prepared at this time to complete the papers to hand up the certificate of Mr. Shea relating to his efforts to make -- to give notice to the United States Attorney's Office which obviously met their mark.

Your Honor, one other matter is that two of the affidavits as the Court can see by reading them indicate that --

THE COURT: Just a moment before you go ahead. Let's get the dates set here. Today is the 7th and Thursday is the 8th so two weeks from Thursday will be the 22nd; is that correct?

MR. ZEDROSSER: Yes, sir. And your full name is?

MR. RICHTER: Charles Franklin Richter.

MR. ZEDROSSER: Your Honor, the date of the certificate --

THE COURT: I am going to leave out the service because you already served it.

MR. ZEDROSSER: Not with the conformed copy. We would be prepared to conform when I hand it to him.

MR. RICHTER: I will stipulate that I have received a copy and I will conform it.

MR. ZEDROSSER: All right. Fine.

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MR. RICHTER: At the end of the session.

THE COURT: I can make it today's date then.

MR. ZEDROSSER: What time would that be, your Honor?

THE COURT: 10:00 o'clock. Now let me know if this is going to take more than one day.

MR. ZEDROSSER: We will try to figure it out.

MR. SHEA: Your Honor, inspite of the fact that the May 12th shipment apparently has been diverted, perhaps it would still be in everyone's best interest if the affidavit, the supplemental affidavit of Mr. Skinner and my own supplemental affidavit be sealed.

THE COURT: All right.

MR. ZEDROSSER: We are a little concerned about having instructions on how to make bombs and things.

THE COURT: All right, well this is already sealed here.

MR. RICHTER: Your Honor, I ask also in this order to show cause that the full paragraph on page 2 also -- I am sorry, page -- yes, page 2, also be stricken since it may be construed that you have made findings of fact.

(Handing)

THE COURT: Yes.

MR. RICHTER: Thank you, your Honor.

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THE COURT: All right, gentlemen. I am going to have to run.

(Time noted: 6:50 p.m.)

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK, :

Plaintiff, : AFFIDAVIT

- v - : 75 Civ. 2121 (WCC)

THE NUCLEAR REGULATORY COMMISSION, et al. :

Defendants. :

STATE OF NEW YORK)
COUNTY OF NEW YORK : ss.:
SOUTHERN DISTRICT OF NEW YORK)

CHARLES FRANKLIN RICHTER, being duly sworn, deposes and says:

1. I am an Assistant United States Attorney in the office of Paul J. Curran, United States Attorney for the Southern District of New York, attorney for defendants in this action. I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction enjoining defendants from approving or permitting the air transportation of special nuclear materials to, from, in and over the City and State of New York and the United States and its territories until an environmental impact statement on such transportation is completed.

2. The affidavits accompanying this one show the use and importance of special nuclear materials and the safety and security of transporting them by air and related connecting ground transport.

3. The affidavit of Lee V. Gossick, Executive Director for Operations of the Nuclear Regulatory Commission ("NRC"), explains what special nuclear materials are and their uses. He also states that the NRC announced prior to commencement of this action that it would prepare an environmental impact statement covering the transportation

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by air of special nuclear materials. He describes other relevant actions the NRC has recently taken and the reasons for the view of the NRC that there is no sound basis for suspending air shipments of special nuclear materials pending completion of the environmental impact statement.

4. The affidavit of Frank K. Pittman, Director of the Division of Waste Management and Transportation of the Energy Research and Development Administration ("ERDA"), explains the nature of shipments made by ERDA of special nuclear materials for civil and military purposes. He states the reasons for ERDA's position that there is no basis for suspending air transportation of special nuclear materials and the consequences such a suspension would have upon ERDA.

5. The affidavits of Leland C. Rouse, Chief Fuel Cycle Licensing Branch No. 1, NRC, Joseph V. Catania, Staff Assistant for Audits, NRC and G. Wayne Kerr, Chief Agreements and Exports Branch, NRC, discuss the use of air transport of special nuclear materials by NRC licensees. The Rouse affidavit also notes the consequences upon NRC licensees if air transport of special nuclear materials were suspended.

6. The Kerr affidavit also details the regulations of New York City and State agencies covering special nuclear materials and the prior knowledge of New York State of the modes of transporting special nuclear materials.

7. The affidavit of Dixie Lee Ray, Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs, describes the effect upon American foreign relations of a suspension of international air shipments of special nuclear materials into and out of the United States.

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8. The remaining affidavits deal with the safety and security of shipping special nuclear materials by air and related connecting transport. The affidavit of Herbert H. Kaiser, Jr., Deputy Assistant Secretary for Environment, Safety and Consumer Affairs of the Department of Transportation ("DOT") shows the safety of air transportation and that there is far less likelihood of an air plane accident than of a train or truck accident.

9. The affidavit of Donald A. Nussbaumer, Assistant Director for Materials, Agreements and Transportation, NRC describes (1) the history of Federal Safety Regulations governing the transportation of special nuclear materials, (2) the conformity of these regulations with world-wide standards issued by the United Nations International Atomic Energy Agency, (3) the standards for containers used in transporting special nuclear materials, and (4) their ability to retain their contents in the event of an aircraft accident.

10. The affidavit of Robert F. Barker, Chief of the Transportation and Products Standards Branch, NRC, describes the consequences in the event of a failure of a container carrying special nuclear material.

11. The affidavit of Ralph G. Page, Acting Director of the Division of Safeguards, NRC, discusses the security aspects of guarding special nuclear materials against theft, diversion or sabotage, and the security advantages provided by air transportation of these materials.

12. Finally, the affidavit of Maj. Gen. Ernest Graves, Jr., Director of the Division of Military

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Application, ERDA, discusses statements made in one of plaintiff's affidavits regarding the possible use of special nuclear materials by terrorists.

Charles Franklin Richter

CHARLES FRANKLIN RICHTER
Assistant United States Attorney

Subscribed and sworn to
before me this 30 day
of May, 1975.

Ralph L. Lee

RALPH L. LEE
Notary Public, State of New York
No. 41-2292838 Queens County
Term Expires March 30, 1977

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT, NEW YORK

THE STATE OF NEW YORK, Plaintiff, v. THE NUCLEAR REGULATORY COMMISSION, et al., Defendants.	)	AFFIDAVIT 75 Civ. 2121 WCC

MONTGOMERY COUNTY)
) ss.:
STATE OF MARYLAND)

Lee V. Gossick, being duly sworn, deposes and says:

1. I am Executive Director for Operations of the United States Nuclear Regulatory Commission ("NRC") and, as such, I have overall responsibility for coordinating and directing the effective performance of the NRC's day-to-day operation and administrative activities. I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction restraining defendants from approving or permitting the transportation by air, and related connecting transport, of special nuclear materials to, from, in and over the City and State of New York and the United States and its territories until completion of an environmental impact statement on such transport.

2. Special nuclear material is defined in 42 U.S.C. § 2014(aa) and in NRC regulation 10 CFR 70.54(m). At the present time such material is limited to plutonium and uranium enriched in the isotope 233 ("U-233") or in the isotope 235 ("U-235").

3. Special nuclear materials are used extensively both in the United States and in foreign countries in the nuclear power industry, other industries, medicine and research:

(a) Uranium with a low enrichment of U-235 (between two and four percent) is the fuel used in commercial nuclear energy

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plants in the United States and abroad to produce electrical power. There are presently 53 such plants in the United States with a total rated electrical capacity of 36,000 megawatts, or approximately 7% of the total electrical output of the nation. There are 95 such plants located in approximately 15 foreign countries with a total rated electrical capacity of 23,711 megawatts. Plutonium is also being used experimentally in the United States as a nuclear reactor fuel and is being more extensively used for this purpose in Europe. Since there is a finite amount of uranium which will one day be depleted, use of plutonium as reactor fuel may extend the time during which nuclear energy could be a commercial power source.

(b) An example of industrial use of special nuclear material is "logging" of oil wells. In logging oil wells, a mixture of plutonium and beryllium in an encapsulated form is placed under ground in order to find oil bearing strata.

(c) Plutonium is used in medicine to power some heart pacemakers which have been implanted in hundreds of persons both here and abroad. The National Institute of Health is also studying the use of these plutonium batteries to power an artificial heart which could totally replace a person's defective heart.

(d) Special nuclear materials are extensively used in basic research in nuclear physics and nuclear materials, as well as in applied research to develop better and safer nuclear reactors

for commercial use. There are many research reactors throughout the United States which use plutonium and highly enriched uranium as a fuel source. These reactors are located at Federal Government installations, such as the Brookhaven National Laboratory on Long Island, at corporate facilities, such as those of General Electric, and at many universities including the Universities of Michigan, Nebraska and Kansas. Plutonium is also used in many radioisotopic thermal electric generators which serve as a power supplier where a long-lasting reliable power source is essential, such as in lunar aircraft, orbiting spacecraft and deep sea research.

4. The use, handling and transportation of special nuclear materials is subject to extensive regulations which have been developed since 1948.

5. The NRC, which was organized in January 1975 pursuant to the Energy Reorganization Act of 1974 (42 U.S.C. § 5801 et seq.), has assumed the functions of the abolished Atomic Energy Commission ("AEC") with respect to licensing and regulating the use and transportation of nuclear materials, including special nuclear materials. Its relevant regulations,which had originally been promulgated by the AEC, are at 10 CFR Parts 20, 70, 71, and 73.

6. The Department of Transportation ("DOT") has overlapping jurisdiction over providing standards of safety in packaging and transportation of radioactive materials under the Transportation of Explosives and Other Dangerous Materials Act and the Transportation Safety Act of 1974 (P.L. 93-633, 88 Stat. 2156). Its relevant regulations are at 49 CFR Parts 170 through 17[illegible].

7. The Federal Aviation Administration ("FAA") has similar overlapping jurisdiction under the Federal Aviation Act of 1958 (49 U.S.C. § 1421-1430, 1472(b)) with respect to transportation

of special nuclear materials by air. Relevant FAA regulations are at 14 CFR Part 103.

8. The AEC solicited public comment in virtually all of its rulemaking proceedings relating to transportation, through publication of a notice of proposed rulemaking in the Federal Register in compliance with Section 4 of the Administrative Procedure Act. Upon information and belief, the same is true of the DOT and the FAA.

9. Since its organization in January of this year, the NRC has stated its intention of reviewing its regulations and procedures, which had originally been promulgated by the AEC, pertaining to the licensing and regulations of nuclear facilities and materials.

10. As part of this review, the NRC has announced, prior to the commencement of this action, that it would prepare an environmental impact statement concerning the transportation of radioactive materials, including special nuclear materials, by air and alternative means of transport. This statement will consider the issues sought to be raised in this action, including standards for containers used in transporting special nuclear materials and safeguards against theft, sabotage and diversion of special nuclear materials.

11. It is anticipated that a draft impact statement will be available for circulation for public comment by the end of the year.

12. The statement is an integral part of a rulemaking proceeding concerning the transportation of radioactive materials which NRC is initiating. The rulemaking proceeding and the environmental impact statement will be coordinated with the DOT and the FAA, which, as noted above, have overlapping jurisdiction over safety aspects of packaging and transportation of radioactive materials. It is anticipated that the impact statement will be finalized and the rulemaking proceeding completed in the

summer of 1976. Attached hereto is a copy of a notice to be published in the Federal Register reflecting these developments.

13. As shown by the attached notice, it is the present view of the NRC that there is no reason for suspending air shipments of special nuclear materials pending the completion of this environmental impact statement and the reexamination of present applicable regulations and procedures. The Commission's present view is based upon the following reasons:

(a) In more than 25 years of shipping special nuclear materials, including plutonium, in civilian aircraft, there have been no air accidents involving these materials.

(b) The experience in shipping thousands of packages per year of all forms of radioactive materials by all modes of transport under existing NRC, DOT and FAA regulations has been very favorable.

(c) The risk involved in the transportation of special nuclear materials under currently effective regulations is believed to be small in view of the protection provided against severe accidents by the high integrity packaging required by NRC, DOT, and FAA regulations (see the accompanying affidavits of Robert F. Barker and Donald A. Nussbaumer), the consistency of these requirements with international standards (see the accompanying affidavit of Donald A. Nussbaumer), and the physical security measures now required (see the accompanying affidavit of Ralph G. Page). As shown by the attached notice, the Commission will invite public comment on this question and will reconsider its view in the light of comments received.

14. In order to allay any concerns the public may have, the Commissioners of the NRC themselves are reviewing any new applications for licenses for the import or export of significant

quantities of plutonium and other special nuclear material.*/ In addition, the Commissioners intend to review any NRC licensee shipments by air of significant quantities of plutonium imported or exported under existing licenses. These case-by-case reviews by the Commissioners will include both safety and security considerations, as well as use of alternative modes of transportation. The case-by-case review procedure will continue at least until public comments on the possible suspension of air shipments have been received and evaluated.

15. In order to ensure even greater safety in the transportation of special nuclear materials, the NRC has proposed an amendment to its regulations which would require licensees to give the NRC advance notice of domestic shipments of strategic quantities of special nuclear materials. Strategic quantities are two kilograms or more of plutonium or uranium U-233, or five kilograms or more of uranium enriched to 20% or more in U-235.

The purpose of this proposed regulation would be to provide an opportunity for advance inspection by the NRC of domestic shipments of such materials from safety and security standpoints. Public comments on this proposed rule have been received and Commission action is expected in the near future. In the interim, the NRC has requested licensees to voluntarily notify it in advance of such shipments and they have been cooperating.

LEE V. GOSSICK

Subscribed and sworn to
before me this 29th day
of May, 1975. My commission expires July 1, 1978.

Carol A. Durham, Notary Public

*/ Significant quantities means, for these purposes, one effective kilogram. One effective kilogram for plutonium and uranium 233 is one kilogram by weight. For enriched uranium, the weight in kilograms of the material equivalent to one effective kilogram varies with the enrichment. For example, 1.2 kilograms of 90% enriched uranium, 4 kilograms of 50% enriched uranium and 400 kilograms of 5% enriched uranium are all equal to one effective kilogram.

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NUCLEAR REGULATORY COMMISSION

[10 CFR PARTS 71 AND 73]

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL BY AIR

Following its organization under the Energy Reorganization Act of 1974 (Public Law 93-438), the Nuclear Regulatory Commission (NRC) has stated its intention of reviewing those of its regulations and procedures pertaining to the licensing and regulation of nuclear facilities and materials which were originally promulgated by the Atomic Energy Commission, with a view to considering what changes should be made. As part of that effort, the NRC is initiating a rule making proceeding concerning the air transportation of radioactive materials, including packaging, with a view to the possible amendment of its regulations in 10 CFR Parts 71 and 73, adopted pursuant to the Atomic Energy Act of 1954, as amended. The NRC considers the re-evaluation of these particular regulations to be especially timely in view of concerns that have been recently expressed by public officials and others as to the safety and security of air shipment of plutonium and other special nuclear materials through highly populated metropolitan areas.

The Department of Transportation (DOT) has overlapping jurisdiction over safety in packaging and transportation by air of radioactive materials under the Transportation of Explosives and Other Dangerous Materials Act (18 U.S.C. 831-835) and the Transportation Safety Act of 1974 (P.L. 93-633, 88 Stat. 2156), and the Federal Aviation Administration has similar overlapping jurisdiction under the Federal Aviation Act of 1958 (49 U.S.C.

1421-1430, 1472(b)). It is expected that the expertise of these agencies will be utilized in the subject rule making proceeding.

Background of Present Regulations

Following a prohibition against shipment of radioactive material by mail in 1936 to protect unexposed film, safety regulations for shipping radioactive material were adopted by the Interstate Commerce Commission in 1948. Those regulations were based on a report of a National Academy of Sciences - National Research Council Subcommittee on Transportation of Radioactive Material. The basic principles reflected in those regulations were reviewed and adopted, with minor modifications and some elaboration, by the International Atomic Energy Agency (IAEA) in 1961 and reflected in recommended International Standards for the Safe Transport of Radioactive Material. In 1964, on the basis of shipping experience up to that date and an analysis of transportation accidents prepared by the United Kingdom Atomic Energy Authority, the IAEA issued revised transport regulations incorporating specific accident damage test standards which were incorporated into the NRC (then AEC) and DOT (then within the jurisdiction of the ICC) regulations by 1968. Except for changes in the regulations to deal with specific problems (e.g., leak testing of packages containing liquids, prompt pickup and monitoring of packages, restrictions on shipments of plutonium on passenger aircraft, opening and closing procedures), the safety regulations have remained essentially the same since that time.

The safety standards for transportation, as set forth in NRC's regulation in 10 CFR Part 71 and DOT regulations in 49 CFR Parts 170-178, are based

on two main considerations: (1) protection of the public from external radiation and (2) assurance that the contents are unlikely to be released during either normal or accident conditions of transport or, if the container is not designed to withstand accidents, that its contents are so limited in quantity as to preclude a significant radiation safety problem if released. These safety standards are applicable to packages used in all modes of transport and were developed with the objective of providing an acceptable level of safety for transport of radioactive material by any mode.[1/] With respect to air shipments, it was considered that, taking into account the high integrity of the packaging[2/] and the low accident

1/ In contrast to the safety standards described above, NRC's requirements for the physical protection (security) of strategic quantities of special nuclear material, including plutonium, in 10 CFR Part 73, are specific as to the mode of transport.

2/ Container designs required to meet accident conditions are evaluated under current regulations against the following accident test conditions in sequence: 30-foot free drop of the container in the most damaging position onto a flat, essentially unyielding surface, 40-inch drop onto a steel bar to test the ability to withstand puncture, 30-minute fire test at 1475° F and 3-foot water immersion test for eight hours. The puncture test and the drop test are engineering qualification tests. The test conditions were chosen to provide reproducible laboratory conditions representative of severe transportation accident environments. For example, a 30-foot drop onto an unyielding surface produces impact or shock loads which are more severe than drops of several thousand feet onto targets such as land, water, or even city streets which would tend to yield when struck by the package. Because of the conservatism of most designs, packages, when subjected to tests involving free fall from much greater heights than 30-feet, have either remained undamaged or continued to contain their contents. For example, a number of packages which pass the NRC qualification tests have also been tested under extra severe conditions such as a 250-foot free fall onto an essentially unyielding surface. Packages currently approved for bulk shipment of plutonium oxide and nitrate will survive such test conditions. These extra severe tests provide added assurance that (continued)

probability for air transportation (no more than one accident per 100 million miles), the risk of an air accident resulting in a release of radioactive material from a package was small.

NRC packaging standards are applicable to shipments by NRC licensees, while DOT regulations are applicable to transportation of radioactive material by land in interstate and foreign commerce, on civil aircraft, and on water. DOT regulations in Title 49 of the Code of Federal Regulations and FAA regulations in 14 CFR Part 103 cover labeling and conditions for shipment and carriage as well as certain packaging. NRC regulations exempt carriers from their application in view of the controls exercised over carriers by DOT and its component parts, including FAA.

For the purpose of developing and implementing consistent, comprehensive and effective regulations for the safe transport of radioactive material and to avoid duplication, the DOT (then ICC) and the AEC (NRC's predecessor) entered into a Memorandum of Understanding in 1965 which was superseded by a revised Memorandum of Understanding signed on March 22, 1973. Under the revised memorandum, the AEC (now NRC) develops performance standards for package designs and reviews package designs for Type B[3/] fissile and large

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2/ (continued) containers, in much the same manner as aircraft flight recorders, could survive severe air accidents. A description of these tests is set forth in SC-DR-72 0597 (Sept. 1972), "Special Tests for Plutonium Shipping Containers 6M, SP5795, and L-10", a copy of which is available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C.

3/ A Type B package is required for quantities in excess of a few millicuries and up to 20-50,000 curies, depending upon the radionuclide. Such packages are required to be designed to withstand accident conditions as well as normal conditions of transport.

quantity packages. The DOT develops safety standards governing handling and storage of all radioactive material packages while in possession of a common, contract or private carrier, as well as standards for Type A packages.[4/] DOT requires AEC (now NRC) approval prior to use of all Type B, fissile and large quantity package designs. DOT is the National Competent Authority with respect to foreign shipments under the IAEA transport standards. IAEA Certificates of Competent Authority are issued by DOT with technical assistance provided by NRC as requested.

Re-evaluation of Present Regulations

Consistent with the considerations expressed in the first paragraph of this notice, the NRC has decided that its regulations governing air transportation of radioactive material, including packaging, should be re-evaluated from the standpoint of radiological health safety and prevention of diversion and sabotage as well. In connection with this reevaluation, the NRC has instructed its staff to commence preparation of a generic environmental impact statement on the air transportation of radioactive materials, including packaging and related ground transportation. The statement will be directed at air transportation. However other transportation modes - land and water transport - will be considered in light of the requirement of the National Environmental Policy Act of 1969 (NEPA) that the relative costs and benefits of alternatives to certain proposed Federal actions be fully considered. It is anticipated that the draft generic environmental impact statement will

4/ A Type A package is required for less than Type B quantities of radioactive material and is required to be designed to withstand normal conditions of transport only.

be available by the time that any proposed changes to the regulations eventuating from this rule making proceeding are published for comment in the FEDERAL REGISTER. While the generic impact statement is in preparation, impact statements or impact appraisals for individual NRC licensing actions related to the transportation of radioactive materials, such as import licenses for significant quantities of plutonium and other special nuclear material, will be prepared as required by NEPA and 10 CFR Part 51.

In order to aid the NRC in this re-evaluation of existing regulations pertaining to radioactive material transported by air, interested persons are invited to submit information, comments and suggestions with respect to those aspects of the above-referenced NRC regulations. The NRC is particularly interested in receiving views on the following:

1. Whether radioactive materials should continue to be transported by air, considering the need for, and the benefits derived from such transportation, the risks to public health and safety and the common defense and security associated with such transportation, and the relative risks and benefits of other modes of transport.

2. Assuming a justifiable need for air transportation of radioactive materials, to what extent should safety requirements be based on:

(a) accident probabilities

(b) packaging

(c) procedural controls

(d) combinations of the above?

3. What is the relative risk of transport of radioactive material by air compared to other modes of transport, and to other hazards faced by the public which may or may not be the subject of regulation?

4. Are improvements in applicable regulations necessary, and if so, what improvements should be considered?

Documentation supporting the views expressed by interested persons would be helpful to the NRC in re-evaluation of its regulations relating to air transportation of radioactive materials and consideration of possible changes to such regulations.

It should be noted that there are some related issues which will be, or are presently, the subject of consideration in other rule making proceedings and, therefore, will not be included in this proceeding. They are:

1. Physical security protection requirements for strategic quantities of special nuclear material that would apply to all modes of transport (39 F.R. 40006).

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2. Requirements for advance notice of shipments of strategic quantities of special nuclear material (40 F.R. 15098).
3. Quality assurance requirements for packages for all special nuclear material (38 F.R. 35190).
4. Radiation levels from radioactive material transported in passenger aircraft.

If it subsequently appears that additional issues should more properly be treated in a separate proceeding, or proceedings, appropriate notices to that effect will be published in the FEDERAL REGISTER.

Interested persons should send comments and suggestions, with supporting documentation, to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Docketing and Service Section by . Copies of comments received may be examined in the NRC Public Document Room at 1717 H Street, N. W., Washington, D. C.

After comments have been received and considered, the NRC will publish its views as to NRC rules pertaining to air transportation of radioactive material in the FEDERAL REGISTER. When the aforementioned draft environmental impact statement is prepared, notice of its availability will be published in the FEDERAL REGISTER and opportunity for public comment afforded pursuant to NRC regulations implementing the National Environmental Policy Act of 1969 (10 CFR Part 51). In addition, background information on the subject of

regulation of transportation of radioactive materials has been placed in the NRC Public Document Room at 1717 H Street, N. W., and at its local public document rooms throughout the nation. Copies of such background information are available upon request in writing to the Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D. C. 20555.

Interim Evaluation

Recently there have been several requests that air shipments of plutonium and other special nuclear materials (and related ground transportation of special nuclear materials incidental thereto) be suspended pending re-examination of presently applicable regulations. In assessing the appropriateness of such action at this time, the NRC has considered the following:

- In more than 25 years of shipping special nuclear material, including plutonium, in civilian aircraft, there have been no air accidents involving the material.
- The experience in shipping thousands of packages per year of all forms of radioactive materials by all modes of transport under existing NRC, DOT, and FAA regulations has been very favorable.
- The requests that have been received do not set forth any significant new information which would indicate that present package or security requirements are inadequate.

- In view of the physical security measures now required by 10 CFR Part 73, the protection provided against severe accidents by the high integrity packaging required by NRC, DOT, and FAA regulations (summarized supra), the consistency of these requirements with international standards, the low accident probability (supra), and the favorable experience to date, the risk involved in the transportation of radioactive material under currently effective regulations is believed to be small.

Accordingly, it is presently the view of the NRC, subject to consideration of comments to be received, that its currently effective regulations can continue to be applicable during the period in which this rule making proceeding is in progress. More particularly, in light of present information as to the safety and security of air shipments of radioactive material, the Commission finds no sound basis, for the reasons stated above, for requiring the suspension of such shipments.

Notwithstanding the foregoing, in view of the concerns expressed and the fact that requests have been received for the suspension of air shipments of plutonium and other special nuclear materials, comments are specifically invited on the matter of whether suspension or other limitations on the air transportation of plutonium and other special nuclear materials are justified during the period that the subject rule making proceeding is

being conducted. Views on this particular matter, together with the supporting basis for these views, should be submitted to the Secretary of the Commission, U.S. Regulatory Commission, Washington, D. C. 20555, Attention: Docketing and Service Section by .
The NRC will decide, after evaluating the views and comments received, whether a different course should be pursued during the pendency of this rule making proceeding and publish its conclusions in the FEDERAL REGISTER. Currently effective regulations will continue to be applied until a decision on this matter is made.

As indicated above, related specific issues will be, or are presently, the subject of consideration in other rule making proceedings, and the NRC will continue to take appropriate action, as justified by the circumstances, to assure that the risk associated with the transportation of radioactive materials remains small.

Dated at Washington, D. C. this 29th day of May 1975.

FOR THE NUCLEAR REGULATORY COMMISSION

Secretary of the Commission

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK, Plaintiff, -v- NUCLEAR REGULATORY COMMISSION, et al., Defendants.	AFFIDAVIT 75 Civ. 2121 (WCC)

DISTRICT OF COLUMBIA)
WASHINGTON, D.C.) SS.:

FRANK K. PITTMAN, being duly sworn, deposes and says:

1. I am employed by the United States Energy Research and Development Administration ("ERDA") as the Director of the Division of Waste Management and Transportation and I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction.

2. In my capacity, I am knowledgeable about agency policy and practices regarding the transportation of all nuclear materials, including plutonium and other special nuclear materials. I was formerly employed by the United States Atomic Energy Commission, the predecessor agency of ERDA, where I held the same position and had the same responsibilities.

3. ERDA transports or tenders to carriers for transport special nuclear materials which include plutonium and enriched uranium. Such shipments are made both domestically and internationally. All modes of transportation are used, including air.

4. International shipments are, for the most part, related to the international nuclear power export program whereby ERDA supplies nuclear fuels and materials to foreign nations pursuant to Agreements for Cooperation and contracts for civil uses of atomic energy.

5. The largest quantity of special nuclear materials transported abroad under these Agreements for Cooperation consists of uranium slightly enriched in the isotope U-235 for the fueling of reactors abroad. The mode of transport of such material is generally the responsibility of the exporter and need not be approved in advance. However, our information, based upon the past experience of ERDA and its predecessor, AEC, indicates that virtually all such material is shipped from the United States by

surface transport.

6. In addition to shipments of slightly enriched uranium, ERDA ships much smaller quantities of other special nuclear materials including plutonium and highly enriched uranium for many of the same purposes that such materials are used in the United States. The majority of such shipments are made by non-governmental shippers. Although ERDA does not keep a continuous record of these shipments, our experience indicates that a large percentage moves to foreign consignees by commercial air transport.

7. ERDA also makes domestic shipments of special nuclear materials to and between its various plants and laboratories, and Department of Defense installations, as well as between commercial fuel fabricators and independent research centers.

8. The purposes of ERDA's domestic shipments of special nuclear materials are manyfold, and include: shipments of nuclear weapons and components, as well as material used in connection with the naval reactor program; special nuclear materials utilized in the research and development of the Liquid Metal Fast Breeder Reactor; and small quantities of special nuclear materials for medical and other research uses. The largest percentage, by far, of such shipments relate to defense programs.

9. ERDA maintains records on all special nuclear materials, but it does not keep daily records of the mode of transportation for each shipment of such materials at this time. However, a recently conducted sampling of a six month period revealed that about ? 100 shipments were made during that time. About 400 of these were transported by air, and more than 90 percent of the air shipments were related to defense programs. Records which include the mode of transportation on all national security shipments of special nuclear materials are kept, but are classified.

10. Shippers in the private nuclear industry are required to obtain license from the Nuclear Regulatory Commission (NRC), and are required to meet NRC's transportation safety regulations. 10 CFR 71. ERDA's own facilities are generally exempt from NRC licensing, but ERDA has established the formal policy of following NRC's safety standards in all of ERDA's own operations. ERDA Manual Chapters 0529 and 5201. Both ERDA shippers and NRC licensees, as well as all surface and air carriers, are required

to meet the Hazardous Materials Regulations of the Department of Transportation (42 CFR 170-189 and 14 CFR 103). In those cases where the requirements of national security dictate some technical departure from those regulations (e.g., the description of defense materials being shipped is often classified), shipments are made in a manner which provides an equivalent degree of safety. Air carrier operations must be approved by the Civil Aeronautics Board. Import and export shipments meet the regulations of the International Atomic Energy Agency, and the international air carriers must meet the regulations of the International Air Transport Association. Thus there is already a broad base of domestic and international regulations governing the safety of nuclear air shipments.

11. In addition to the extensive measures taken to provide against accidents in shipments of special nuclear materials, there are substantial safeguards against theft, sabotage, and diversion. Many of these safeguards techniques are necessarily classified to ensure their effectiveness pursuant to Sections 11(y) and 142(d) of the Atomic Energy Act of 1954, as amended, 42 USC 2014, 2162, and Executive Order 11652.

12. For purposes of this affidavit, it can generally be stated that ERDA's activities, at a minimum, meet the safeguards requirements established by the Nuclear Regulatory Commission.10 CFR Part 73. Additionally, our own safeguards measures provide an increased degree of protection where necessary, principally because of the military nature of many ERDA shipments.

13. Special nuclear materials have been shipped safely by air for over 25 years. During that time, there have been no air crashes involving air shipments of these materials on commercial aircraft. None of these materials in commercial shipments has ever been accidentally released from their containers while being transported by air, and there have been no overexposures to radiation of crew, passengers, or other people as a result of this transportation.

14. In addition to the excellent safety record of air transportation, the reduced travel time, a key attribute of this mode, enhances this option by reducing the opportunities for theft, sabotage, and diversion.

15. Air transportation provides an expedited, economical mode for shipping all materials, including special nuclear materials. It is an

integral part of ERDA's entire transportation system, and has unique advantages. It is particularly useful for shipping smaller packages such as those utilized in the shipment of plutonium. To foreclose this important transportation option would not only reduce efficiency and economy, but also could adversely affect the agency's operations which are diverse and geographically dispersed throughout the country.

State of Md, Md City

Frank K. Pittman

Subscribed and sworn to before
me this 2nd day of May, 1975.

Notary Public

My Com. Exp 7-1-75

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK	:	
Plaintiff,	:	
-v-	:	AFFIDAVIT
THE NUCLEAR REGULATORY COMMISSION et al.,	:	75 Civ. 2121 WCC
Defendants.	:	

MONTGOMERY COUNTY)
: SS.:
STATE OF MARYLAND)

Leland C. Rouse, being duly sworn, states:

1. I am Chief, Fuel Cycle Licensing Branch No. 1, United States Nuclear Regulatory Commission ("NRC") and I submit this affidavit in opposition to plaintiff's motion for preliminary injunction.

2. I have been employed by the NRC and its predecessor, the Atomic Energy Commission ("AEC"), since October 1963. I am currently responsible for the issuance of licenses authorizing the possession and use of special nuclear material and source material, particularly as related to nuclear fuel cycle activities.

3. The purpose of this affidavit is to show the potential effect upon NRC licensees if air shipments of special nuclear material were suspended pending completion of an environmental impact statement covering such transportation now being prepared by the NRC.

4. Licenses issued by the NRC and its predecessor, the AEC, authorize the licensee to receive, possess and use the radioactive materials specified in the license. They also provide authority for the licensee to deliver and transfer such material to an authorized recipient.

5. Neither the NRC nor previously the AEC have specified the mode of transport to be used by licensees because the applicable regulations were considered to provide an acceptable level of safety for transport of radioactive materials by any mode.

6. The NRC currently has over 500 licensees authorized to possess special nuclear material. The amount and form of such material that the licensees are permitted to possess range widely. In addition, there are 25 States, including the State of New York, which have the authority to issue licenses for possession and use of special nuclear material up to certain maximum quantities. (See the accompanying affidavit of G. Wayne Kerr.)

7. Thus, a temporary suspension of shipments of special nuclear material by air could have a potential impact on a large number of NRC licensees and a number, which is unknown to me, of licensees licensed by authorized States.

8. The accompanying affidavit of Joseph V. Catania discusses the number of domestic shipments in 1974 of highly enriched uranium and of plutonium. Upon information and belief, the total number of shipments identified in his affidavit were made by nearly 100 different licensees.

9. Upon information and belief, all of the air shipments of substantial amounts of plutonium routed through JFK Airport in 1974 were in conjunction with exports or imports to or from foreign countries. There were six air shipments of plutonium weighing in excess of 2 kilograms each; two were imports from Belgium and four were exports to West Germany. In addition, there were three air shipments of plutonium weighing in excess of 200 grams each, all of which were exports to Belgium.

10. Mr. Catania's affidavit does not include data on shipments of low enriched uranium, i.e., uranium whose enrichment of U-235 is less than 20%. Low enriched uranium, with an enrichment of 2 to 4%, is the prevalent reactor fuel of the nuclear power industry. Thus, there are large quantities of this type of special nuclear material, relative to the quantities of plutonium and highly enriched uranium, being shipped by licensees, both domestically and internationally. Because of the size and weight of the packages, it my understanding that the bulk of this low enriched uranium is not transported by air. Nevertheless, upon

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information and belief, there are some air shipments of low enriched uranium in quantities ranging from a few grams or less as analytical samples to several thousand kilograms, e.g., air shipment of completed reactor fuel assemblies weighing several hundred kilograms each.

11. As to international shipments of special nuclear material from foreign countries into the United States, attached as Exhibit A hereto is a table listing licensee import shipments of such material between January 1972 and April 1975. The table shows that there were 87 shipments of enriched uranium and 16 shipments of plutonium, excluding shipments of small, sealed plutonium sources. (Many of these shipments of small plutonium sources were sources for use in heart pacemakers; see footnote 2 to Exhibit A.)

12. Information is not readily available as to the mode of transport for the shipments listed in Exhibit A. However, upon information and belief, most of the shipments were by air. The exceptions would be the large quantities of low enriched uranium and shipments of irradiated fuel elements because the weight of such shipments would make air transport impracticable.

13. Of these plutonium shipments, most were imported into the United States via JFK Airport because most came from Europe and JFK is the major international airport on the East Coast. Attached hereto as Exhibit B is a copy of a letter dated April 24, 1975, from Mr. Howard J. Larson, Director, Division of Materials and Fuel Cycle Facility Licensing, NRC, to the Honorable James H. Scheuer, United States Representative from New York. This letter includes a listing of such plutonium imports via JFK Airport from January 1972 to April 1975.

14. The accompanying affidavit of G. Wayne Kerr deals with air shipments of special nuclear material from the United States to foreign countries. Mr. Kerr indicates that there were approximately 200 shipments by air of special nuclear material exported in 1974.

Most of these consisted of relatively small quantities.

15. The NRC is not aware of shipments of significant quantities of plutonium either into or out of JFK Airport by NRC licensees anytime in the future. The shipment which the plaintiff asserted in its papers would be arriving by air on May 12, 1975 at JFK never occurred. This shipment will be made by ship.

16. Since present NRC regulations leave it to the licensee to select the mode of transporting special nuclear material, the need or basis for selection of air transport is more properly the province of licensees to describe.

17. However, it is apparent that the reasons to ship special nuclear material by air, as with any material, involves factors of economics, reliability, convenience and speed in delivery. Also, containers are less likely to be delayed or misrouted when transported by air than by surface transport, particularly when long distances are involved.

18. A few examples of where delivery by air transport of special nuclear material may be required are:

(a) Plutonium batteries contained in heart pacemakers, designed and built to rigid standards to assure the containment of the plutonium, have been implanted in about 500 individuals. Such pacemakers, which contain one-half gram or less of plutonium, are usually shipped by air from the manufacturers to the hospitals for implantation.

(b) Plutonium-berryllium neutron sources (encapsulated sources) are used by oil well service companies for logging oil wells. At times this service may be needed on short notice at a certain stage of the drilling operation, not always predictable beforehand and at some distance away.

(c) At times, during nuclear power reactor shutdowns in order to refuel, replacement fuel assemblies have been damaged or potentially damaged during handling operations. Repair or replacement has involved air shipment to minimize the period of time the reactor is out of service. Reactors have

also required emergency air shipments of neutron detectors which contain small quantities of high enriched uranium. These detectors are required for operation of the reactors.

(d) Analytical samples of various kinds of special nuclear material and for various purposes are often sent by air because of time factors.

19. In addition, as the accompanying affidavit of Ralph G. Page notes, there are protection advantages, from the security standpoint, offered by air transport over other modes of transport.

20. In sum, a temporary suspension of air shipments of special nuclear material by NRC licensees would deny them the most rapid means of delivery when speed may be essential or preferable and would deny them a reliable means of transport.

Leland C. Rouse

Leland C. Rouse

Subscribed and sworn to
before me this 29th day
of May, 1975

Carol J. Dunbrack

Notary Public

My commission expires July 1, 1978.

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LICENSEE IMPORT SHIPMENTS OF SPECIAL NUCLEAR MATERIAL

January 1972 - April 1975

ENRICHED URANIUM

Consignee	Date	Country of Origin	Quantity Uranium Kilograms	Per cent U-235	Material Type
Westinghouse					
Columbia, SC	8-30-72	Japan	0.07	4.28	Oxide
" "	12-15-72	Italy	1,096.90	4.07	Oxide
" "	1-24-73	Japan	317.10	3.40	Oxide
" "	6-12-73	Canada	5.85	3.04	Oxide
" "	7-26-74	Italy	569.30	4.38	Oxide pellets
Forest Hills, PA	8-29-73	Belgium	0.10	3.09	Oxide pellets
" "	10-1-74	Belgium	0.10	2.00	Oxide
Cheswick, PA	7-18-72	Canada	38.70	3.03	Fuel Elements
General Electric Co.					
Wilmington, NC	2-14-72	Japan	51.70	2.16	Fuel Rods
" "	4-17-72	Japan	37.40	1.40	Oxides
" "	6-26-72	Japan	50.50	2.91	Oxides
" "	1-23-73	Japan	68.70	2.68	Oxides
" "	5-10-73	Japan	1,531.20	1.30	Oxides
[illegible], CA	4-3-72	Japan	0.85	1.99	Fuel Elements
" "	4-19-72	Japan	1.89	2.01	Fuel Elements
" "	4-19-72	Japan	0.42	2.13	Fuel Elements
" "	6-1-72	Japan	0.45	2.22	Fuel Elements
" "	8-18-72	Canada	4.27	93.14	Oxide
" "	5-23-74	Japan	5.37	2.68	Oxide Pellets
San Jose, CA	10-12-72	Germany	0.23	2.18	Oxide
" "	10-12-72	Germany	0.11	0.90	Oxide
" "	8-31-73	Japan	99.30	2.55	Oxide
" "	11-17-73	Germany	0.16	1.24	Oxide pellets
" "	12-14-73	Japan	80.40	2.89	Oxide
" "	12-27-73	Japan	65.10	1.93	Oxide
" "	7-14-74	Norway	0.31	2.93	Fuel Elements

Consignee	Date	Country of Origin	Quantity Uranium Kilograms	Per cent U-235	Material Type
General Atomic Co.					
San Diego, CA	2-17-72	Switzerland	0.01	100.0	Oxide
" "	3-10-72	Germany	0.01	100.0	Oxide
" "	3-17-72	Germany	0.08	86.9	Fuel Elements
" "	3-28-72	Germany	0.11	86.9	Fuel Elements
" "	11-12-73	Germany	0.27	92.93	Carbides
" "	4-26-74	Germany	0.01	90.0	Carbides
" "	5-16-74	Germany	0.55	91.55	Carbides
Gulf United Nuclear					
New Haven, CT	9-7-72	Canada	411.60	2.24	Oxide
" "	3-26-74	U.K.	404.00	1.76	Oxide pellets
" "	4-7-74	U.K.	2.88	2.04	Oxide pellets
" "	4-15-74	U.K.	977.70	2.12	Oxide pellets
" "	4-18-74	U.K.	928.30	1.77	Oxide pellets
" "	5-8-74	U.K.	1.43	2.30	Oxide pellets
" "	5-16-74	U.K.	2,026.60	2.33	Oxide pellets
" "	5-24-74	U.K.	8.40	2.33	Oxide pellets
" "	6-1-74	U.K.	4,859.50	2.33	Oxide pellets
" "	6-2-74	U.K.	651.20	2.34	Oxide pellets
Hematite, MO	4-26-73	Netherlands	119.50	3.79	Fuel Elements
" "	4-26-73	Netherlands	48.70	3.80	Oxide pellets
" "	5-17-73	U.K.	0.95	3.56	Oxide
" "	5-21-73	U.K.	0.02	5.88	Oxide pellets
Combustion Engineering					
Windsor, CT	12-27-72	Germany	0.13	3.17	Oxide
" "	6-19-73	Germany	0.50	3.00	Oxide
" "	12-19-73	Norway	0.18	7.14	Oxide pellets
" "	3-18-74	Norway	1.26	11.41	Oxide
Babcock & Wilcox					
Lynchburg, VA	9-18-74	U.K.	934.20	3.97	Oxide pellets
" "	9-23-74	U.K.	1,863.70	3.97	Oxide pellets
" "	10-9-74	U.K.	4,448.20	3.93	Oxide pellets

PLUTONIUM IMPORTS VIA JFK

1/72 - 4/75

	Name of Licensee	Quantity of Pu licensed	Form of Pu	Date of License Application	Date of License Expiration	Point of Origin	Destination in U. S.	Return of Material
1.	Gulf Oil Corp. San Diego, Calif.	10 g	Sealed sources, maximum 0.2 gm per source	10-25-71	12-31-72	England	Gulf Oil Corp. San Diego, Cal.	Not returned
			Shipment: 0.9 gram 3-21-72 (Other shipments not via JFK)					
2.	General Electric Co. Vallecitos, Calif.	20 Kg	Powder, Pellets, or sealed fuel rods	1-9-73	4-30-78	Belgium	General Electric Co. Vallecitos, Calif.	Pellets not returned; sealed fuel rods returned
			Shipments: 10 grams 3-7-73 sintered pellets 6 grams 8-9-73 sintered pellets 17 grams 1-28-74 sealed fuel rods 4.9 Kg 2-20-74 sealed fuel rods					
3.	British Nuclear Fuels, Ltd. Washington, D.C. (Shipping agent: Edlow International)	25 Kg	Oxide (Powder)	4-6-73	9-30-73	England	Exxon Nuclear Co. Inc. Richland, Wash.	Not returned
			Shipment: 17.4 Kg 6-4-73					
4.	Edlow International Washington, D.C.	1.5 Kg	Oxide	11-7-73	1-31-74	England	Exxon Nuclear Co. Inc. Richland, Wash.	Not returned
			Shipment: 1.3 Kg 11-7-73*					

*NOTE: Typographical error in original transmittal. Date should have been 11-22-73.

PLUTONIUM IMPORTS VIA JFK

1/72 - 4/75 - (Cont.)

	Name of Licensee	Quantity of Pu licensed	Form of Pu	Date of License Application	Date of License Expiration	Point of Origin	Destination in U. S.	Return of Material
5.	Edlow International Washington, D.C.	65 g	Sealed fuel rods	11-29-73	2-28-74	Belgium	Intelcom Industries, Inc. San Diego, Cal.	Not returned
			Shipment: 42 grams 12-14-73					
6.	Transnuclear Falls Church, Va.	140 Kg	Oxide	3-20-74	11-30-75	Belgium	Westinghouse Electric Cheswick, Pa.	Application submitted by Westinghouse for export of fuel rods to Italy (Trino Reactor)
			Shipments: 45 Kg 7-28-74 Oxide 48 Kg 2-25-75 Oxide					
7.	Medtronic, Inc. Minneapolis, Minn.	11 g Pu per shipment	Pu-238 in sealed pacemaker power sources 0.176 g per source	2-16-72	10-31-78	France	Medtronic, Inc. Minneapolis, Minn.	About 300 sources have been exported after incorporation into pacemaker units
			Shipments: From 5-1-72 to 4-15-75, 840 sources (0.176 g/source) totaling 148 g of Pu were imported. Port of entry was Minneapolis - St. Paul Airport with probable routing through JFK.					

Consignee	Date	Country of Origin	Quantity Uranium Kilograms	Per cent U-235	Material Type
Babcock & Wilcox					
Lynchburg, VA	10-24-74	U.K.	4,436.00	3.98	Oxide pellets
" "	11-6-74	U.K.	2,039.60	3.98	Oxide pellets
" "	11-20-74	U.K.	2,198.10	3.99	Oxide pellets
" "	1-12-72	Germany	91.20	2.52	Oxide
Battelle					
Columbus, OH	1-23-73	Spain	0.22	2.32	Fuel Elements
" "	11-27-73	U.K.	0.39	4.08	Fuel Elements
" "	4-4-74	Spain	12.60	1.54	Irradiated Fuel
Northwest Wash.	6-15-73	Canada	15.00	3.51	Oxide
" "	6-22-73	Germany	0.51	3.12	Oxide pellets
" "	6-29-73	France	0.42	3.55	Oxide pellets
United Nuclear					
Wood River Jct. RI	9-15-72	Canada	0.12	56.3	Alloy
" " "	9-15-72	Canada	7.88	92.99	"
Intelcom					
San Diego, CA	6-27-74	Sweden	2.22	1.89	Fuel Elements
Gaseous Diffusion Plants					
Portsmouth, Ohio	4-6-72	U.K.	4,427.80	1.55	UF_6
" "	1-3-73	France	136.60	60.00	UF_6
" "	8-22-73	France	78.00	79.98	UF_6
" "	9-27-73	France	25.00	79.70	UF_6
" "	3-7-74	France	90.10	60.64	UF_6
" "	6-13-74	France	44.10	73.47	UF_6
" "	10-3-74	France	31.60	78.97	UF_6
Oak Ridge, TN	8-10-72	Franch	5,731.80	0.94	UF_6
" " "	10-1-72	France	1,971.70	1.40	UF_6
" " "	10-6-72	France	1,348.40	1.43	UF_6
" " "	12-26-72	France	2,909.30	1.36	UF_6
" " "	1-31-73	U.K.	7,298.60	1.16	UF_6
" " "	2-20-73	U.K.	1,452.90	1.16	UF_6

Consignee	Date	Country of Origin	Quantity Uranium Kilograms	Per cent U-235	Material Type
Gaseous Diffusion Plants (con't)					
Oak Ridge, TN	5-25-73	U.K.	8,538.60	2.25	UF_6
" " "	6-5-73	U.K.	1,458.30	2.63	UF_6
" " "	6-27-73	U.K.	7,831.30	2.25	UF_6
" " "	7-16-73	France	7,302.20	1.52	UF_6
Reprocessing Plant					
Savannah River, SC.	8-16-74	Sweden	3.27	70	Irradiated Fuel Elements
" " "	11-16-74	Sweden	3.70	70	Irradiated Fuel Elements
" " "	2-7-75	Sweden	3.51	70	Irradiated Fuel Elements

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LICENSEE IMPORT SHIPMENTS OF SPECIAL NUCLEAR MATERIAL

January 1972 - April 1975

PLUTONIUM

Consignee	Date	Country of Origin	Quantity of Pu Kilograms	Material Type
Atlantic-Richfield				
Hanford, WA	6-8-73	U.K.	39.26	Oxide
" "	12-10-74	Australia	4.10	Plutonium Aluminum Alloy
Westinghouse				
Cheswick, PA	5-1-74	Japan	0.30	Fuel Elements
" "	7-28-74	Belgium	45.13	Oxide
" "	2-25-75	Belgium	48.28	Oxide
General Electric				
Vallecitos, CA	3-7-73	Belgium	0.01	Oxide pellets
" "	5-19-73	U.K.	.04	Oxide
" "	8-9-73	Belgium	.01	Oxide pellets
" "	1-28-74	Belgium	.02	Fuel Elements
" "	2-20-74	Belgium	4.86	Fuel Elements
Exxon				
Richland, WA	6-4-73	U.K.	17.37	Oxide
" "	11-22-73	U.K.	1.25	Oxide
" "	6-25-74	U.K.	17.77	Oxide
Intelcom				
San Diego, CA	6-27-73	Belgium	0.01	Oxide
"	6-27-73	Belgium	0.01	Fuel Elements
"	12-14-73	Belgium	0.04	Oxide

Plutonium (con't)

In addition to the above imports of plutonium:

1. General Atomic, San Diego, California, imported from England a total of 19.3 grams of Pu-238 as sealed sources (maximum of 0.2 grams per source) over the period of 3-21-72 to 11-3-72.

2. Medtronic, Inc., Minneapolis, Minnesota, imported from France a total of 148 grams of Pu-238 as contained in sealed pacemaker sources (0.176 grams per source) over the period of 5-1-72 to 4-15-72.

EXHIBIT B

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 2 4 1975

Honorable James H. Scheuer
House of Representatives

Dear Mr. Scheuer:

We are pleased to respond to your letter of April 1, 1975 concerning import licensing and shipping of plutonium oxide into the United States via JFK Airport.

We believe that the enclosed table is responsive to the requests contained in the first paragraph of your letter. The table summarizes the imports of plutonium authorized by AEC (now NRC) licenses which have entered the United States via JFK Airport since January 1, 1972. In some instances multiple shipments are made under a single import license. This information has been included in the table. The table also specifies the chemical and/or physical form authorized by the import license.

The Nuclear Regulatory Commission has not published a generic safety evaluation of air shipments of plutonium oxide nor has it prepared specific safety evaluations in connection with individual import licensing actions. The safety of transportation incident to import of special nuclear material (SNM) is governed by current rules and regulations of NRC (formerly AEC) and the Department of Transportation (DOT), which include provisions for prior NRC approval of specific shipping containers. Such evaluations are independent of import licensing. However, the person applying for an import license must confirm that the material will be packaged in an approved shipping container.

The Commission's and DOT's regulations pertaining to transportation of radioactive materials specify safety standards for packages used in transportation of radioactive materials and do not distinguish among the different modes of transportation. These standards which packages must meet are based on two main considerations: (1) protection of the public from external radiation, and (2) assurance that either the contents of the container are unlikely to be released during either normal or accident conditions of transport or if the container is not designed to withstand accidents, the contents are so limited to preclude a significant safety problem if released.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

With respect to air shipments, it was considered that taking into account the high integrity packaging required and the low accident probability for air transportation (no more than one accident of any type per 100 million miles), the risk of an air accident resulting in a release of radioactive material from a package was very small.

Since its inception, the NRC has not proposed or adopted any regulations pertaining to air transportation other than a proposed amendment to Part 73 that would require advance notice of shipments of strategic quantities of special nuclear material, published April 5, 1974, which solicited public comment. The Atomic Energy Commission solicited public comment in virtually all of its rule making proceedings relating to transportation, through publication of a notice of proposed rule making in the FEDERAL REGISTER in compliance with Section 4 of the Administrative Procedure Act.

Neither this Commission nor the Atomic Energy Commission prepared an environmental impact statement assessing the effects and impact of promulgation and implementation of the Commission's rules regarding the export or import by air and related transport of nuclear materials through the United States. In view of the expressed concerns for public safety, the Commission intends to conduct a rule making proceeding that will cover transportation of special nuclear material, including plutonium, by air, as indicated in Chairman Anders' letter to you of April 3, 1975. This proceeding will, of course, afford opportunity for public participation. An environmental impact statement will be prepared in connection with this rule making proceeding.

Sincerely,

Original Signed By
[illegible]

for Howard J. Larson, Director
Division of Materials and
Fuel Cycle Facility Licensing

Enclosure:
Table, Plutonium Imports
via JFK Airport

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,	:	
Plantiff,	:	
-v-	:	AFFIDAVIT
THE NUCLEAR REGULATORY COMMISSION, et.al.,	:	75 Civ. 2121 WCC
Defendants.	:	

MONTGOMERY COUNTY)
: SS.:
STATE OF MARYLAND)

Joseph V. Catania, being duly sworn, deposes and says:

1. My name is Joseph V. Catania. I am employed by the United States Nuclear Regulatory Commission (NRC) as a Staff Assistant for Audits in the Office of Inspection and Enforcement. I regularly review and audit data collected by the Nuclear Material Information System (NMIS) for the purpose of assuring that the quantities and location of all types of special nuclear material held and transferred by licensees has been recorded in the NMIS.

2. I have prepared this affidavit to summarize the quantities of certain special nuclear material which were transported in the U.S. during 1974 and the number of shipments by each mode (i.e., air or surface transportation).

3. Pursuant to Section 70.54 of 10 CFR Part 70, all transfers of special nuclear material in amounts of 1 gram or more of contained uranium-235, uranium-233 or plutonium must be reported to the NRC (or during 1974, to the Atomic Energy Commission). Among the information which the licensee must report is quantity of material, isotopic content, destination, date of shipment and date of receipt. The information resides in a computer located in Oak Ridge, Tennessee.

4. Information on all such shipments made in 1974 is discussed in this affidavit.

5. During 1974 no shipments of U-233 in excess of 1 gram were made.

6. The data were organized into two categories: U-235 contained in uranium enriched to 20% or more in the U-235 isotope, and Pu.

7. The U-235 data were organized into 4 categories on the basis of quantity as follows: (i) shipments of 1 gram to less than 500 grams; (ii) shipments of 500 grams to less than 1000 grams; (iii) shipments of 1000 grams to less than 2000 grams; (iv) shipments of 5000 grams or more.

8. For each of the quantity categories for U-235, we determined the number of shipments and the total number of grams shipped. The results were:

Shipment Category	Number of Shipments	Quantity of U-235 in Grams
1 gram to less than 500 grams	824	15,187
500 grams to less than 1000 grams	57	9,537
1000 grams to less than 5000 grams	353	754,670
5000 grams or more	298	22,031,584
TOTAL	1532.	22,810,978.

9. For shipments of U-235 of 5,000 grams or more, we asked our Inspection and Enforcement Regional Offices to call each such shipper and determine the number of shipments made by each mode of transportation and the total quantity of U-235 which had been shipped by each mode. The results were

Mode of Transport	Number of Shipments	Quantity of U-235 in Grams
Air	4	146,531
Surface	294	21,885,053
TOTAL	298.	22,031,584.

These were no sea or rail shipments of these materials during 1974.

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10. There were approximately 1,200 shipments of small quantities of high enriched uranium containing less than 5,000 grams per shipment during 1974. We selected the month of October, 1974, for a statistical test of these data. The results were:

Mode of Transpor	Number of Shipments	Quantity of U-235 in Grams
Air	13	2,235
Surface	90	39,133
Total	103.	41,368.

11. The plutonium data were organized into 4 categories on the basis of quantity as follows: (i) shipments of 1 gram to less than 10 grams; (ii) shipments of 10 grams to less than 200 grams; (iii) shipments of 200 to less than 2,000 grams; (iv) 2,000 grams or more. For each of these quantity categories for plutonium, the number of shipments and the total number of grams shipped were determined. The results were:

Shipment Category	Number of Shipments	Quantity of Plutonium in Grams
1 gram to less than 10 grams	104	171
10 grams to less than 200 grams	87	4,065
200 grams to less than 2000 grams	106	47,227
2000 grams or more	75	2,065,790
Total	372.	2,117,253.

12. For shipments of plutonium of 2,000 grams or more, we asked our Inspection and Enforcement Regional Offices to call each such shipper and determine the number of shipments made by each mode of transportation and the total quantity of plutonium which had been shipped by each mode. The results were:

Mode	Number Shipments	Quantity of Plutonium in Grams
Air	24	752,270
Surface	51	1,313,520
Total	75.	2,065,790.

There were no sea or rail shipments of these materials during 1974.

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13. For shipments of plutonium of 200 grams but less than 2,000 grams, we asked our Inspection and Enforcement Regional Offices to call each such shipper and determine the number of shipments made by each mode of transportation and the total quantity of plutonium which had been shipped by each mode. The results were:

Mode	Number of Shipments	Quantity of Plutonium in Grams
Air	6	5,950
Surface	100	41,277
Total	106.	47,227.

Joseph V. Catania

Sworn to and suscribed
before me this 29th day
of May, 1975.

NOTARY PUBLIC
My commission expires July 1, 1978.

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,
Plaintiff
-v-
THE NUCLEAR REGULATORY COMMISSION et.al,
Defendants.

AFFIDAVIT

75 Civ. 2121 WCC

MONTGOMERY COUNTY)
: SS.:
STATE OF MARYLAND)

G. WAYNE KERR, being first duly sworn upon oath, states:

1. I am Chief, Agreements and Exports Branch, U. S. Nuclear Regulatory Commission (the "NRC"), and I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction.

2. I have been an employee of the NRC and its predecessor, the Atomic Energy Commission, since December 1961. My duties have been concerned with the licensing of radioactive materials, the enforcement program for materials licenses and review and liaison work with Agreement States. I am currently responsible for the administration of the NRC Agreement State program and the export licensing program.

3. I have prepared this affidavit in order to 1) describe the agreement by which the State of New York regulates certain radioactive materials, 2) the nature of the State's regulations regarding the transportation of certain radioactive materials, and 3) provide information with respect to air shipments to foreign countries of 200 grams or more of plutonium or uranium 235 contained in uranium enriched to 20% or more by weight during 1974.

History of New York as an Agreement State

4. Section 274 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. § 2021, provides that a State may enter into an agreement with the NRC whereby the NRC relinquishes and the State assumes regulatory control over certain uses, within the State, of source,

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byproduct, and small quantities of special nuclear material (agreement materials). The Commission must find that the State program is compatible with the Commission's program for the regulation of agreement materials and that the State program is adequate to protect the public health and safety with respect to the agreement materials. The State can regulate up to a maximum of 200 grams of plutonium or 350 grams of uranium 235 or 200 grams of uranium 233 at any one location within the State.

5. Such an agreement with the State of New York became effective on October 15, 1962. A copy of the agreement is attached as Exhibit A.

6. As an Agreement State, New York would have known, since at least the date its agreement became effective, the types and forms of special nuclear materials, the existence of Federal regulations covering their transportation, and the various modes in which such materials may be transported.

7. The New York program for regulation of agreement materials is administered by three agencies, namely the New York State Labor Department, the New York State Health Department, and the New York City Health Department.* The New York State Department of Commerce serves in a coordinating role for these agencies. Their responsibilities generally fall into the following categories:

a. State Labor Department - industrial users of radioactive material throughout the State.

b. State Health Department - medical, academic and research laboratories throughout the State, except in New York City.

c. New York City Health Department - medical, academic and research laboratories in the City of New York.

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* On October 19, 1974, the New York State Department of Environmental Conservation implemented regulations governing the discharge of radioactive materials to the environment including land burial. These regulations do not provide for any regulatory control over transportation.

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Regulations of New York Agencies Relating to Transportation of Special Nuclear Materials

8. The regulations of these three New York regulatory agencies incorporate Federal regulations by reference. Therefore, the State's requirements regarding packaging and mode of transport are the same as those of the Federal agencies and do not impose additional safety requirements regarding these matters.

9. New York State Labor Department - New York State Labor Department rule 12NYCRR38.39 Transportation, provides that transportation of radioactive materials (which includes special nuclear materials) is subject to the requirements of other State agencies and appropriate Federal agencies listed therein. Moreover, where the regulations of the New York State Department of Transportation and the U. S. Department of Transportation are not applicable to shipment of radioactive materials by land, their intrastate transportation must still meet the same requirements. Where the regulations are not applicable to shipment by air or sea, their interstate transportation within the State of New York must still meet the same requirements. The Industrial Commissioner of the State of New York may impose additional requirements as necessary to protect health and safety. Upon information and belief, no such requirements have ever been imposed for air shipments of plutonium or other special nuclear material by the Department. A copy of Labor Department rule 12NYCRR38.39 is attached as Exhibit B.

10. New York State Health Department - The New York State Sanitary Code, Chapter 1, Part 16, Section 16.17 provides that a person may not transport or package for transport, radioactive material outside the confines of his installation unless such transport or packaging conforms to regulations of the appropriate Federal agencies or complies with such requirements as approved by the Commissioner of Health of the State of New York. Upon information and belief, no more restrictive

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requirements have ever been imposed on air shipments of plutonium or other special nuclear materials by the Department. A copy of State Sanitary Code, Chapter 1, Part 16, Section 16.17 is attached as Exhibit C.

11. New York City Health Department-Article 175.111 of the New York City Health Code incorporates Federal requirements by reference but does include some additional requirements regarding notification of certain shipments to the City Health Department, routing of shipments, and escorts for certain types of shipments. A copy of Article 175.111 of the City Health Code is attached as Exhibit D.

12. Upon information and belief, the only other State requirements are those of the State Department of Transportation regulations, 17 NYCRR Part 40.26, requiring special hauling permits for large quantities of radioactive material and shipments, as defined in title 49 of the Code of Federal Regulations, in overweight vehicles and requiring valid certificates of inspection for tractors and trailers.

Listing of foreign-air shipments during 1974

13. During the period from January 1, 1974 through March 26, 1975, the Agreements and Exports Branch issued 233 licenses authorizing the export of special nuclear material. About 190 of these are for small quantities of special nuclear material. Information was not readily available regarding the mode of transport for these licensed exports. However, because of the small quantities and types of materials, I believe that most of them would have been or would be shipped by air.

14. Information was obtained by telephone from the major export licensees with respect to air shipments to foreign countries of 200 grams or more of plutonium or uranium 235 contained in uranium enriched to 20 percent or more by weight made during 1974. This information is attached as Exhibit E.

15. Exhibit E identifies four shipments of plutonium exported to West Germany from J.F.K. Airport in 1974. The shipment of this plutonium originated from a storage facility owned and operated by the New York Atomic and Space Development Authority (ASDA), an agency of New York State, located near West Valley, New York.

16. This New York State facility was licensed by the then AEC in May 1969 to store plutonium nitrate solution in specially designed storage containers. Under the license, ASDA received approval to use its own modified design of a plutonium shipping container for transport of plutonium nitrate to and from the ASDA facility. Upon information and belief, ASDA's inventory consisted for a time of several hundred kilograms of plutonium nitrate. All of this material has now been transported from the facility, including the exports noted above, and the license was terminated in April 1975.

17. Upon information and belief, ASDA was aware that the four shipments of plutonium described above, would be shipped by air via J.F.K. Airport to West Germany.

G. Wayne Kerr

G. Wayne Kerr

Subscribed and sworn to
before me this 29th day
of May, 1975

Notary Public

My commission expires July 1, 1976.

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EXHIBIT A

U. S. ATOMIC ENERGY COMMISSION

(Reprinted from 27 Federal Register, 10419, October 25, 1962)
Notice of Agreement with the State of New York
Effective October 15, 1962

ATOMIC ENERGY COMMISSION

NOTICE OF AGREEMENT WITH THE STATE OF NEW YORK

Agreement between the United States Atomic Energy Commission and the State of New York for discontinuance of certain Commission regulatory authority and responsibility within the State pursuant to section 274 of the Atomic Energy Act of 1954, as amended.

Whereas the United States Atomic Energy Commission (hereinafter referred to as the Commission) is authorized under section 274 of the Atomic Energy Act of 1954, as amended, (hereinafter referred to as the Act) to enter into agreements with the Governor of any State providing for discontinuance of the regulatory authority of the Commission within the State under Chapters 6, 7, and 8, and section 161 of the Act with respect to byproduct materials, source materials, and special nuclear materials in quantities not sufficient to form a critical mass; and

Whereas the Governor of the State of New York is authorized under section 462 of the New York State Atomic Energy Law to enter into this Agreement with the Commission; and

Whereas the Governor of the State of New York certified on July 20, 1962, that the State of New York (hereinafter referred to as the State) has a program for the control of radiation hazards adequate to protect the public health and safety with respect to the materials within the State covered by this Agreement, and that the State desires to assume regulatory responsibility for such materials; and

Whereas information as to the Radiation Control Program within the State of New York was submitted to the Commission on July 20, 1962, August 30, 1962, and October 8, 1962; and

Whereas the Commission found on October 12, 1962, that the program of the State for the regulation of the materials covered by this Agreement is compatible with the Commission's program for the regulation of such materials and is adequate to protect the public health and safety; and

Whereas the State and the Commission recognize the desirability and importance of cooperation between the Commission and the State in the formulation of standards for protection against hazards of radiation and in assuring that State and Commission programs for protection against hazards of radiation will be coordinated and compatible; and

Whereas the Commission and the State recognize the desirability of reciprocal recognition of licenses and exemption from licensing of those materials subject to this Agreement;

Now, therefore, it is hereby agreed between the Commission and the Governor of the State, acting in behalf of the State, as follows:

Article I. Subject to the exceptions provided in Articles II, III, and IV, the Commission shall discontinue, as of the effective date of this Agreement, the regulatory authority of the Commission in the State under Chapters 6, 7, and 8, and section 161 of the Act with respect to the following materials:

A. Byproduct materials;

B. Source materials; and

C. Special nuclear materials in quantities not sufficient to form a critical mass.

Article II. This Agreement does not provide for discontinuance of any authority and the Commission shall retain authority and responsibility with respect to regulation of:

A. The construction and operation of any production or utilization facility;

B. The export from or import into the United States of byproduct, source, or special nuclear material, or of any production or utilization facility;

C. The disposal into the ocean or sea of byproduct, source, or special nuclear waste materials as defined in regulations or orders of the Commission;

D. The disposal of such other byproduct, source, or special nuclear material as the Commission from time to time determines by regulation or order should, because of the hazards or potential hazards thereof, not be so disposed of without a license from the Commission.

Article III. Notwithstanding this Agreement, the Commission may from time to time by rule, regulation, or order, require that the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing source, byproduct, or special nuclear material shall not transfer possession or control of such product except pursuant to a license or an exemption from licensing issued by the Commission.

Article IV. This Agreement shall not affect the authority of the Commission under subsection 161 b or i of the Act to issue rules, regulations, or orders to protect the common defense and security, to protect restricted data or to guard against the loss or diversion of special nuclear material.

Article V. The Commission will use its best efforts to cooperate with the State and other agreement States in the formulation of standards and regulatory programs of the State and the Commission for protection against hazards of radiation and to assure that State and Commission programs for protection against hazards of radiation will be coordinated and compatible. The State will use its best efforts to cooperate with the Commission and other agreement States in the formulation of standards and regulatory programs of the State and the Commission for protection

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against hazards of radiation and to assure that the State's program will continue to be compatible with the program of the Commission for the regulation of like materials. The State and the Commission will use their best efforts to keep each other informed of proposed changes in their respective rules and regulations and licensing, inspection and enforcement policies and criteria, and to obtain the comments and assistance of the other party thereon.

Article VI. The Commission and the State agree that it is desirable to provide for reciprocal recognition of licenses for the materials listed in Article I licensed by the other party or by any agreement State. Accordingly, the Commission and the State agree to use their best efforts to develop appropriate rules, regulations, and procedures by which such reciprocity will be accorded.

Article VII. The Commission and the State recognize that the limits on their respective rights, powers and responsibilities under the Constitution, with respect to protection against radiation hazards arising out of the activities licensed by the Commission within the State, are not precisely clear. The Commission and the State agree to work together to define, within a reasonable time, the limits of, and to provide mechanisms for accommodating, such responsibilities of both parties. Without prejudice to the respective rights, powers and responsibilities of Federal and State authority, the State undertakes to obtain promptly and to maintain in effect while such cooperative endeavors are in progress, a modification of the Health, Sanitary and Industrial Codes which are to become effective within the State as of October 15, 1962, so as to exempt (except for registration; notification; inspection, not including operational testing but including samplers which would not substantially interfere with or interrupt any Commission licensed activities; and routing and scheduling of material in transit) persons of the Commission from so much of such Codes as pertain to protection against radiation hazards arising out of activities licensed by the Commission within the State. While such cooperative endeavors are in progress, the existence or nonexistence of the exemptions and exceptions referred to above shall not prejudice the exercise by the Commission or the State, in an emergency situation presenting a peril to the public health and safety, of any constitutional rights and powers the Federal Government or the State may have now or in the future. If such cooperative endeavors do not result in a definition, within a reasonable time, of the limits of, and provision of mechanisms for accommodating, the responsibilities of the Commission and the State with respect to protection against radiation hazards arising out of the activities licensed by the Commission within the State, then the existence or nonexistence of the exemptions and exceptions referred to above shall not prejudice the exercise by the Commission or the State of any constitutional rights and powers the Federal Government or the State may have now or in the future.

Article VIII. The Commission, upon its own initiative after reasonable notice and opportunity for hearing to the State, or upon request of the Governor of the State, may terminate or suspend this Agreement and reassert the licensing and regulatory authority vested in it under the Act if the Commission finds that such termination or suspension is required to protect the public health and safety.

Article IX. This Agreement shall become effective on October 15, 1962, and shall remain in effect unless, and until such time as it is terminated pursuant to Article VIII.

Done at Washington, District of Columbia, in triplicate, this 15th day of October 1962.

For the United States Atomic Energy Commission.

GLENN T. SEABORG,
Chairman.

Done at Albany, State of New York, in triplicate, this 15th day of October 1962.

For the State of New York.

NELSON A. ROCKEFELLER,
Governor.

[F.R. Doc. 62-10661; Filed, Oct. 21, 1962; 8:47 a.m.]

GPO 935665

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(b) Such person shall conduct, or permit the commissioner to conduct, such tests as he may require, including but not limited to, tests of:

(1) Any radiation source and the installation, institution, establishment, premises or facilities at which such radiation source is located, possessed, stored or used.

(2) Personnel monitoring equipment and any other equipment, instrument or device used in connection with the location, possession, storage or use of such radiation source.

38.39 Transportation.

(a) The transportation of radioactive materials is subject to other State and Federal requirements, particularly the following:

(1) *New York State requirements.* Department of Transportation, Department of Motor Vehicles, certain public authorities and commissions as provided in the Vehicle and Traffic Law and the requirements of cities having populations in excess of one million.

(2) *Federal requirements.* United States Department of Transportation, the Interstate Commerce Commission, the Federal Aviation Agency, the United States Coast Guard and where the mails are used the United States Postal Service.

(b) When the regulations of the New York State Department of Transportation, the United States Department of Transportation or the Interstate Commerce Commission are not applicable to the shipment by land of radioactive materials by persons subject to the provisions of this Part (rule), such transportation shall, nevertheless, be in accordance with the requirements relating to the transportation of radioactive materials set forth in the regulations of the United States Department of Transportation, the Interstate Commerce Commission and the New York State Department of Transportation. Any requests for modifications or exceptions to such requirements, any requests for special approvals referred to in such regulations, and any notifications referred to in such requirements shall be filed with, or made to, the commissioner.

(c) The transportation of radioactive materials by persons subject to the provisions of this Part (rule) shall also be subject to such additional requirements as the commissioner may order as reasonably appropriate and necessary to enforce the provisions of this Part (rule) relating to the general duty to protect health and safety.

38.40 Severability. If any provision of this Part (rule) or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of this Part (rule) which can be given effect without the invalid provision or application and to this end the provisions of this Part (rule) are declared to be severable.

38.41 Tables and appendix. The tables hereto annexed and designated "Table 1 — Exemptions", "Table 2 — Exempt Concentrations", "Table 3 — General Licenses: Items, Terms and Conditions", "Table 4 —

16.17 Transportation. (a) No person shall transport, package for transport, or cause to be transported, outside of the confines of his installation, any radioactive material within this State unless:

(1) such transport conforms to those regulations of the United States Department of Transportation or other agencies of the United States having jurisdiction with respect to packaging of the radioactive material and to the marketing and labeling of the package and transporting vehicle which would be applicable if such transport were interstate; and

(2) procedures are established for opening and closing packages in which radioactive material is transported to provide safety and to assure that, prior to delivery to a carrier for transport, each package is properly closed for transport; and

(3) prior to delivery of a package for transport, such person shall assure that any special instructions needed to open the package are sent to, or have been made available to the consignee; or

(4) such transport complies with such requirements as have been approved by the Commissioner.

(b) Transport of radioactive material is exempt from the requirements set forth in subdivision (a) of this section provided that all of the following conditions are satisfied:

(1) the package must consist of an outer container and an inner container and must be such that there can be no leakage or radioactive material under conditions normally incident to transportation;

(2) the package must contain not more than 0.01 millicurie of any alpha emitting radioactive material exclusive of fissionable material, or 0.1 millicurie of Argon 41, Barium 133, Bismuth 210, Europium 154, Krypton 87, Lead 210, Lead 212, Strontium 90, or Xenon 135, or one millicurie of any beta-gamma emitting radioactive material;

(3) the package must be such that there is no significant removable surface contamination[10] on the exterior of the package and the radiation dose rate at any point on the external surface of the package must be less than 12 milliroentgens for 24 hours; and

(4) the outside of the inner container of the package must bear the marking "RADIOACTIVE".

(c) Transport of radioactive material by a physician for use in the practice of medicine is exempt from the requirements set forth in subdivisions (a) and (b) of this section.

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[10] Removable radioactive contamination is not significant if the average amount of radioactive contamination which can be removed by wiping the external surface of the package with an absorbent material, as measured on the wiping material, does not exceed: (1) 10^{-11} curie per square centimeter beta-gamma (2,200 disintegrations/min. per 100 square centimeters) and 10^{-12} curie per square centimeter alpha (220 disintegrations/min. per 100 square centimeters) for all contaminants except natural or depleted uranium and natural thorium; or (2) 10^{-10} curie per square centimeter beta-gamma (22,000 disintegrations/min. per 100 square centimeters) and 10^{-11} curie per square centimeter alpha (2,200 disintegrations/min. per 100 square centimeters) where the only contaminant is known to be natural or depleted uranium or natural thorium.

EXHIBIT D

§ 175.111 Transportation

(a) The person responsible for the transportation of a radiation source outside of an installation shall take all necessary precautions so that no individual is exposed to ionizing radiation exceeding in amount the maximum permissible dose rate specified in section 175.05 of this Article. Radiation sources shall be containerized and packaged, warning labels shall be affixed to the outer container holding the radiation source, and the airplane, ship, vehicle or rail carrier concerned placarded in conformity with the regulations of the U.S. Department of Transportation, U.S. Atomic Energy Commission or other related federal or state agencies regardless of whether the shipment is being made intracity, intrastate or interstate.

(b) When a radiation source which may involve a high degree of hazard in the event of an accident is to be transported into, within, through or out of the City, the shipper shall first notify the Department of the date of shipment, type and quantity of radiation source involved, method of transportation, route, starting point, destination and such other information as the Department may require. So much of such information as is then available shall be furnished at least two weeks prior to such shipment. The unsupplied information shall be furnished no later than two hours prior to the arrival of the radiation source in the City or in the case of a shipment originating in the City no later than the time of its departure from the point of origin. The radiation source shall be transported through the City over such route or routes, or at such time or times of the day, consistent with the public health and safety and the convenience of the shipper, as the Department may direct.

(c) This section does not apply to radiation sources shipped by or for the United States Government. Nothing herein shall be construed as requiring the disclosure of any defense information or restricted data as defined in the Atomic Energy Act of 1954, as amended.

(d) The following radiation sources may involve a high degree of hazard in the event of accident:

(1) Any quantity of radioactive material specified as a "Large Quantity" by the United States Atomic Energy Commission in 10 C.F.R. Part 71, "Packaging of Radioactive Material for Transport."

(2) Any quantity, arrangement and packaging combination of fissile material specified by the United States Atomic Energy Commission as a "Fissile Class III" shipment in 10 C.F.R. Part 71, "Packaging of Radioactive Material for Transport," or

(3) Any shipment of radioactive material that is required by the appropriate regulating agency to be accompanied by an escort for safety reasons.

(e) Motor vehicles transporting the radiation sources designated in subsection (b) shall follow the "Truck Routes" listed in Article 16 of the Traffic Regulations adopted by the Commissioner of Traffic of the City of New York except that any such motor vehicle may be operated on a street not so listed for the purpose of delivery, loading or servicing, provided it leaves and returns to a listed street by the most direct route.

(f) In addition, in the case of shipments of radiation sources in the following categories the provisions of subsections (g) and (h) below shall be complied with:

(1) More than ten times the quantity specified as a "Large Quantity" of:

(i) Mixed fission products, including that contained in, but not limited to, a shipment of spent nuclear fuel.

(ii) Liquid or gaseous radioactive material.

(2) Missile Class III.

(3) Required to be escorted for safety reasons.

(4) Any intrastate (New York) or intracity (New York City) "Large Quantity" shipment of radioactive material which does not meet the U.S. Department of Transportation packaging, labeling and placarding requirements in all respects.

(g) The shipper shall notify the Department and shall arrange with the Department for an escort through this City at a time to be designated by the Department. He shall report the point of entry into the City or point of origin within the City and such other information as is required by this Code.

(h) If the destination is within this City to a pier, airport or other delivery point and facilities are not available during the night for unloading upon arrival, the motor vehicle shall be parked out-of-doors and not close to any building. The driver shall remain with the vehicle until the materials are unloaded.

(i) The following exemptions, subject to the specified conditions, will not result in undue danger to life and health:

(1) All shippers of "Large Quantity" radiation sources may be exempt from the requirement of reporting their proposed route, provided they follow the "Truck Routes" specified in subsection (e) above.

(2) All shippers of "Large Quantity" radiation sources ten times or less than the designated quantity may be exempt from supplying the Department with the information prescribed by this section, provided they follow the "Truck Routes" specified in subsection (e) above and leave the city without making a delivery and without any loading, servicing or layover within the City.

(j) Vehicles passing over any bridge under the jurisdiction of the Department of Highways shall meet the provisions of Local Law No. 49 of 1954, section 68Ja-2-1.0 of the Administrative Code of The City of New York governing the maximum dimensions and weights of vehicles.

(k) Transport of radioactive material within the City by a physician for use in the practice of medicine is exempt from the requirements of this section, provided that such material is not transported via mass transit facilities.

§ 175.112 Radioactive incidents, contaminations, thefts, losses and reports thereof

EXHIBIT E

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Export Shipments of Plutonium and High Enriched Uranium

Export Licensee	Date of Shipment	Amount	Air Route
Transnuclear, Inc.	2/27/74	12.471 Kg Pu	J. F. Kennedy to West Germany
Transnuclear, Inc.	4/3/74	24.718 Kg Pu	J. F. Kennedy to West Germany
Transnuclear, Inc.	9/27/74	36.464 Kg Pu	J. F. Kennedy to West Germany
Transnuclear, Inc.	10/19/74	36.442 Kg Pu	J. F. Kennedy to West Germany
Transnuclear, Inc.	3/2/74	317.656 Kg U, 23% enriched	Cleveland to Japan
Transnuclear, Inc.	10/30/74	117.211 Kg U, 93.15% enriched	Dayton to West Germany
Transnuclear, Inc.	12/18/74	113.659 Kg U, 93.15% enriched	Dayton to West Germany
Transnuclear, Inc.	6/14/74	93.595 Kg U, 93.0% enriched	Dayton to West Germany
Transnuclear, Inc.	11/7/74	128.577 Kg U, 93.0% enriched	Dayton to France
Transnuclear, Inc.	3/2 /74	96.045 Kg U, 93.0% enriched	Cleveland to West Germany

Transnuclear made no shipments of significant quantities of Pu or high enriched uranium by mode other than air.

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Export Licensee	Date of Shipment	Amount	Air Route
Gulf Nuclear Fuels	One shipment to Canada via truck		
Nuclear Fuel Services	No shipments		
Edlow International	No shipments		
U. S. Nuclear	3/27/74	2.998 Kg U, 93.15% enriched	Atlanta to Greece
U. S. Nuclear	4/23/74	3.511 Kg U, 93.15% enriched	Atlanta to Greece
U. S. Nuclear	8/6/74	3.399 Kg U, 93.15% enriched	Atlanta to Portugal
U. S. Nuclear	8/13/74	4.256 Kg U, 93.15% enriched	Atlanta to Portugal
U. S. Nuclear	11/27/74	4.298 Kg U, 93.15% enriched	Atlanta to South Africa
U. S. Nuclear	12/31/74	3.438 Kg U, 93.15% enriched	St. Louis to S. Africa
U. S. Nuclear made one shipment of high enriched uranium during this period to Canada by truck.			
General Electric	8/13/74	1.629 Kg Pu	San Francisco to Netherlands
General Electric	8/13/74	1.551 Kg Pu	San Francisco to Netherlands
General Electric	7/10/74	1.629 Kg Pu	San Francisco to Netherlands
Exxon	No shipments		

Export Licensee	Date of Shipment	Amount	Air Route
Westinghouse	No Shipments		
General Atomics	9/4/74	634 grams U, 93% enriched	Los Angeles to West Germany
General Atomics	12/20/74	1.910 kg U, 70% enriched	Los Angeles to South Korea

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,	:	
Plaintiff,	:	
-v-	:	AFFIDAVIT
THE NUCLEAR REGULATORY COMMISSION, et.al.,	:	75 Civ. 212(WCC)
Defendants.	:	

DISTRICT OF COLUMBIA)
: SS.:
WASHINGTON, D.C.)

DIXY LEE RAY, being sworn, deposes and says:

1. I am Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs, and I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction.

2. In my capacity, I have primary responsibility for the development and implementation of United States policy concerning United States international activities in the field of atomic energy and energy-related research and development. I have held this position since January 29, 1975. Previously, from February 6, 1973 to January 19, 1975, I was Chairman of the United States Atomic Energy Commission, of which I had been a member since August 8, 1972.

3. In the event that transportation by air of special nuclear materials licensed, approved, allowed, or executed by the United States Government were enjoined to, from in or over the City and State of New York and the United States and its territories pending the preparation of an Environmental Impact Statement under the National Environmental Policy Act of 1969, it is my

judgment, for the reasons set forth below, that this would be detrimental to United States foreign relations, and, in particular, to the United States program of cooperation in the peaceful use of atomic energy.

4. Special nuclear materials are used abroad for power generation, and for industrial, medical and research purposes. As a fuel for power reactors for example such material will provide, according to European Community forecasts, 34 percent of the power generated in 1985 and 60 percent of the power generated in 2000 in Western European countries.

5. The United States Government has developed an extensive international program of cooperation in the peaceful use of atomic energy. At present, the United States is a party to 29 agreements for cooperation with 28 foreign countries, as well as agreements with the International Atomic Energy Agency ("IAEA") and the European Atomic Energy Community ("EURATOM"), under the terms of the Atomic Energy Act (the "Act") of 1954, as amended. These countries and a number of the member states of the IAEA and EURATOM receive special nuclear materials pursuant to such agreements. The principal recipients of nuclear materials under this program are the industrial countries of Western Europe and Japan, with which the United States maintains its most important political, economic, and defense relationships.

6. This program of international cooperation serves United States national security and economic interests. Our role as a principal supplier of nuclear materials places the United States in a position where it can and does insist upon stringent safeguards against

a diversion of such materials from peaceful purposes. Thus, the program has played an important part in forwarding the non-proliferation objectives of the United States.

7. Pursuant to Section 123 of the Act, as amended, 42 U.S.C.§2153, special nuclear materials may, except as otherwise exempted* be distributed abroad or licensed for export only pursuant to an Agreement for Cooperation.

8. Section 123 of the Act requires that Agreements for Cooperation include (a) the terms, conditions, duration, nature, and scope of the cooperation; (b) a guaranty by the cooperating party that security safeguards and standards as set forth in the Agreement will be maintained; (c) except for Agreements for the military uses of atomic energy, a guaranty by the cooperating party that any material to be transferred pursuant to such agreement "will not be used for atomic

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* As amended by Public Law 93-377, the Act permits the export without a cooperation agreement of (a) special nuclear material in quantities or for classes of users or uses when the Commission makes a finding that exemption from licensing requirements would not be inimical to the common defense and security and would not constitute an unreasonable risk to the health and safety of the public and (b) plutonium containing 80 percent or more by weight of plutonium -238 providing the Commission does not find such distribution would be inimical to the common defense and security. 42 U.S.C. §§2074(b), 2077(d).

weapons, or for research on or development of atomic weapons or for any other military purposes"; and (d) a guaranty that any material or Restricted Data made available under the Agreement will not be transferred to unauthorized persons or beyond the jurisdiction of the cooperating party except as the Agreement may provide.

9. All Agreements for Cooperation must be approved by the President after a written determination that performance of the Agreement "will promote and will not constitute an unreasonable risk to the common defense and security." Thereafter, depending on the extent of cooperation to be undertaken, civil Agreements for Cooperation must lie before either the Joint Committee on Atomic Energy for thirty days or before the Congress for sixty days while Congress is in session before they may be brought into effect. Agreements involving significant cooperative activities may be prevented from being brought into effect if the Congress, by Concurrent Resolution, expresses its disapproval of the proposed agreement during the sixty day waiting period.

10. From an economic perspective, the international nuclear program has significant benefits to the balance of payments, to United States industry, and to workers in the United States. Foreign sales of nuclear equipment and materials, for example, are expected to bring a cumulative balance of payments benefit to the United States of 25 billion dollars by 1990.

11. The image and position of the United States as a responsible and dependable supplier of nuclear material are crucial to the effective imple-

mentation of its program of cooperation in the peaceful uses of atomic energy.

12. Loss of confidence in the United States as a responsible supplier of nuclear material may lead to a serious weakening in the ability of the United States to forward its non-proliferation objectives, which are an important element in United States national security policy. Foreign nations heretofore dependent upon the United States as their source of special nuclear materials could turn to other governments as alternative sources, which may not insist upon safeguards equivalent to those required by the United States, or could develop an indigenous capacity to produce such material. In either situation, the national security of the United States would be expected to suffer.

13. In addition, the weakening of foreign markets for United States nuclear exports would have serious adverse economic effects, including the loss of income and employment for United States industry and a weakening of balance of payments.

14. As is seen in the affidavit submitted by Mr. G. Wayne Kerr of the Nuclear Regulatory Commission, almost all of the significant quantities of highly enriched uranium and plutonium and in all probability most shipments of small quantities as well that were exported in 1974 were transported by air. Suspension of such transportation and the inevitable delays caused by reliance upon alternative modes of transportation could undermine the carefully established reputation of the United States as a dependable supplier of nuclear materials. This is because foreign customers

tend to perceive internal United States actions which unilaterally affect the conditions of supply as indicating a decreased dependability in United States behavior.

15. Doubts have already been created in the minds of foreign customers regarding the dependability of the United States as a supplier of special nuclear material. As a result of changes in United States enrichment services supply and contracting policy in 1974, we received concerned inquiries or protests from a number of foreign governments, including some of our important allies. Recently, licensing delays with regard to particular pending shipments, caused by the transformation of the Atomic Energy Commission into the Nuclear Regulatory Commission and the Energy Research and Development Administration, have brought additional concerned inquiries or protests from a number of foreign governments, again including some of our major allies.

16. Although smaller quantities of special nuclear material are currently being imported into the United States than exported, as the nuclear industry abroad increases in scale, imports of special nuclear material will also increase as increasing amounts of such materials are produced abroad. The United States can be expected to expand its fuel cycle activities, such as reenrichment and plutonium fabrication performed in the United States. At this point similar economic and national security considerations as set forth above in paragraphs 3 through 15 will become applicable, as this material will then be subject to re-export.

DIXY LEE RAY

Sworn to before me this
18th, day of May, 1975.

Irene Rizallo

Notary Public

My Commission Expires June 14, 1978

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,

-v-

NUCLEAR REGULATORY COMMISSION, et al.,

Defendants.

AFFIDAVIT
75 Civ. 2121 WCC

DISTRICT OF COLUMBIA)
: SS.:
WASHINGTON, D.C.)

HERBERT H. KAISER, JR., being first duly sworn, deposes and says:

1. I am currently Deputy Assistant Secretary of the United States Department of Transportation (DOT) for Environment, Safety, and Consumer Affairs and I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction.

2. DOT's Office of Environment, Safety, and Consumer Affairs is responsible for those activities of the Secretary of Transportation pertaining to transportation safety and the security of passengers and cargo, among other functions. The responsibility of this office concerning the safe transportation of hazardous materials — including special nuclear material — is carried out through the Office of Hazardous Materials (OHM), which develops and recommends regulations on this subject. OHM also performs and sponsors research to determine the adequacy of existing regulations and to determine methods of improving the safety of hazardous materials transportation. Finally, OHM provides advice and training in hazardous material transportation for operating administrations within DOT, such as the Federal Aviation Administration (FAA).

3. I am making this affidavit on my own knowledge and upon information and belief available to me in my official capacity.

Transportation of Special Nuclear Material

4. a. When properly packaged, labeled, and handled, existing regulations permit special nuclear material to be transported by all present modes of transportation: that is, by air, by motor carrier, by

railroad, or by boat. As a result of the Transportation Safety Act of 1974 and DOT/FAA implementing regulations adopted thereunder, quantities of up to 20 curies of plutonium or other special nuclear material may be transported on either passenger-carrying or all-cargo aircraft, provided it is intended for use in or incident to research, medical diagnosis or treatment and when its packaging, labeling, and handling conform to all applicable DOT/FAA regulations.

b. To give some illustration of the quantities of plutonium which may be carried with passengers on commercial air carriers, approximately 16 grams of plutonium (one ounce is 28 grams) is equivalent to one curie, depending upon the particular isotope involved. Approximately 20 grams of plutonium oxide would be equivalent to one curie. This means that 320 grams of pure plutonium or 400 grams of plutonium oxide — approximately 11 and 14 ounces respectively — could be transported via passenger-carrying aircraft, as well as by cargo-only aircraft, provided the shipment was intended for or incident to research, medical diagnosis or treatment.

c. Larger quantities of special nuclear material or that not intended for or incident to research, medical diagnosis or treatment, can be transported only by all-cargo aircraft or by appropriate truck, rail, or water transportation.

Aircraft Safety

5. For purpose of statistics compiled by the National Transportation Safety Board (NTSB), an aircraft accident is defined to mean (14 C.F.R. sec. 430.2):

> ...an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which any person suffers death or serious injury as a result of being in or upon the aircraft or anything attached thereto, or the aircraft receives substantial damage.

Thus, whenever a person is seriously injured as a result of turbulence — as indeed is the most frequently-occurring cause of all air carrier accidents reported to the NTSB —this would be counted as an accident, even though it would be unlikely to affect cargo safety.

6. Of 196 accidents investigated by the NTSB in the period 1970-1973, 86 resulted in minor damage or no damage to the aircraft involved. There were 112 NTSB accident records prepared for this period in which the aircraft received substantial damage or was destroyed. 1/

7. The statistics compiled by the NTSB do not attempt to correlate aircraft damage to cargo damage. The extent of cargo damage is not, as a practical matter, directly related to accident severity because of the significant number of variables involved. These include its location within the plane, the stress absorbed by the plane, the impact absorbed by the aircraft and the resulting stress transmitted to the package. It is therefore impossible to assess whether an accident which the NTSB determined to have resulted in substantial damage to an aircraft also resulted in substantial damage to its cargo. For example, an aircraft which requires a major repair to an engine when its landing gear collapses upon the runway would be classified by the NTSB as being substantially damaged. However, it is unlikely that such an accident would endanger any of its cargo.

8. Even when an aircraft is totally destroyed as a result of an accident, it cannot be assumed that all of its cargo will be destroyed with it. For example, the NTSB recently conducted an

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1/ The NTSB defines substantial damage to mean damage or structural failure which adversely affects the structural strength, performance, or flight characteristics of an aircraft and which would normally require major repair or replacement of the affected component. Damage limited to an engine failure, dented skin, small puncture holes in the skin, and damage to the landing gear, wheels, tires, flaps, engine accessories, brakes, and wing tips is not considered to be "substantial damage" for the purpose of NTSB reports. 14 C.F.R. § 430.2. The NTSB considers an aircraft to be totally destroyed when the damage is so extensive as to be beyond repair.

extensive investigation of the cargo damaged in an accident resulting in the complete destruction of an aircraft in which nitric acid not packaged in accordance with DOT/FAA regulations was suspected as a cause.[2/]

The NTSB reported that, although the cargo-carrying portion of the aircraft was demolished and its contents were strewn over a large area, some cargo remained fastened onto the pallets onto which it had been loaded. NTSB investigators were also able to recover one of the five bottles of nitric acid with its packaging intact. In addition, most of the mail and other cargo in the aft cargo compartments remained in place. The container standards for special nuclear material are more stringent and calculated to be accident-resistant than the packaging standards for nitric acid, which require that the acid be contained in a metal container, which is then packaged in non-combustible material in an outside container, which may be of wood (49 C.F.R. sec. 173.268). The standards for containerization for special nuclear materials are explained in the accompanying affidavit of Donald A. Nussbaum.

9. a. NTSB statistics [3/] show that air travel has become an increasingly safe mode of transportation. Not only has the total number of accidents decreased over the last decade, but the accident rate, as measured in accidents per million aircraft-miles, has been reduced significantly. This remains so despite the fact that more than twice as many aircraft miles were operated in 1973 than in 1963.

2/ Report No. NTSB-AAR-74-16 (adopted December 2, 1974).

3/ Annual Reviews of Aircraft Accident Data, U.S. Air Carrier Operations 1970-1972, National Transportation Safety Board Report No. NTSB-ARC-74-1 (adopted April 11, 1974); Annual Reviews of Aircraft Accident Data, U.S. Air Carrier Operations 1973, National Transportation Safety Board Report No. NTSB-ARC-74-2 (adopted October 24, 1972).

b. The improving safety record of commercial air transportation is set forth in the following table:

Year	Total Accidents	Aircraft-Miles Flown (000)	Accidents Per Million Aircraft-Miles Flown
1963	77	1,231,312	0.063
1964	79	1,336,867	0.058
1965	83	1,536,395	0.054
1966	75	1,768,458	0.042
1967	70	2,179,739	0.032
1968	71	2,498,848	0.028
1969	63	2,736,596	0.023
1970	55	2,684,552	0.020
1971	48	2,660,731	0.018
1972	50	2,619,043	0.019
1973	43	2,646,669	0.016

c. Preliminary NTSB statistics for 1974 [4] show that the decade-long trend of reduced accidents was reversed slightly last year. The accident rate increased to 0.019, when there were 47 accidents and fewer aircraft-miles flown as a result of the fuel crisis.

10. a. The NTSB compiles separate statistics on the safety records achieved on service performed by U.S. all-cargo route air carriers.[5] In all relevant respects, the conditions encountered by all-cargo services are identical to those encountered by regular passenger air service in that the aircraft equipment used on both is virtually identical. However, as previously explained, certain special nuclear material can be air-transported only by cargo-only aircraft. Accordingly, the safety of cargo-only service is relevant to the possibility of an accident-caused release of plutonium in that a shipper of special nuclear materials may elect to avail himself of the services of a cargo-

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4/ A Preliminary Statistical Analysis of Aircraft Accident Data, U.S. Civil Aviation, National Transportation Safety Board Report No. NTSB-APA-75-1 (adopted February 26, 1975).

5/ There now exist three all-cargo air carriers holding certificates of public convenience and necessity from the Civil Aeronautics Board authorizing them to engage in the scheduled air transportation of freight. Certificated passenger air carriers also have extensive all-cargo authority for the routes on which they operate scheduled passenger service.

The foregoing scheduled all-cargo services are supplemented by charter cargo services, which may be operated by certificated carriers or by a separate class of charter-only carriers, known as supplemental carriers, which have operating certificates from the Civil Aeronautics Board.

only carrier.

b. NTSB statistics show that in 1970 about 61 million miles were flown by cargo-only U.S. route carriers. This involved nearly 42,000 separate aircraft flights. In 1970 there were three accidents of aircraft carrying cargo -- and two of these occurred outside of the continental United States.

c. Mention has already been made of the NTSB measurement of accident rate as the number of accidents per million-aircraft miles flown. The NTSB also provides statistics showing the accidents per 100,000 aircraft departures. In 1970, the accident rate for cargo-only carriers was 4.71 per 100,000 departures, compared to 0.905 per 100,000 departures for U.S. route carriers as a whole. The accident rate for each million-aircraft miles was 0.020 for U.S. route carriers as a whole and 0.030 for the all-cargo carriers.

d. In 1971, all-cargo carriers compiled a perfect safety record in over 50,000 takeoffs and landings. The total distance flown by these operations exceeded 34,000,000 miles. The accident rates that year for U.S. route air carriers as a whole were 0.903 per 100,000 departures and 0.02 per every million aircraft-miles.

e. Again in 1972, the operations of U.S. cargo-only carriers were conducted accident-free in more than 32,000 takeoffs and landings. The accident rate for all operations of U.S. route carriers that year was 0.910 accidents for every 100,000 departures and 0.019 for every million aircraft-miles.

f. In 1973, the operations of U.S. cargo-only carriers accounted for nearly 30,000 takeoffs and landings. There was only one accident which involved an all-cargo flight. This produced an accident rate for all-cargo carriers of 0.02 for every million aircraft-miles and 2.60 accidents for every 100,000 departures. The comparable rates for the U.S. route carrier industry on all flights were 0.014 accidents for every million aircraft-miles and 0.709 accidents for every 100,000 departures.

g. Preliminary NTSB statistics for 1974 indicate that there were two accidents involving all-cargo flights that year. One all-cargo aircraft was substantially damaged when a collision with aircraft lights collapsed its landing gear. The other accident, which had not been completely investigated by the NTSB by the time its preliminary statistics had been published, involved the mid-air downing of an aircraft related to thunderstorm turbulence.

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11. It should be borne in mind that the aforementioned statistics are derived from accidents in which there was not necessarily any damage to the aircraft, or only minor damage was involved, but which were reported to the NTSB because an injury to a passenger was involved.

12. These figures also include accidents occuring in mid-air, which normally do not present the risk to residents of a city such as New York as might accidents occurring on takeoff and landing. However, according to NTSB statistics, a minority of all accidents occur either in the taking off or landing phase of aircraft operation. For example, of all accidents in the period 1969-1973, the NTSB reported that 29.3 percent occurred on landing and 11.8 percent on taking off. This means that the foregoing accident rates are slightly overstated and should be reduced correspondingly if account were to be made only of those accidents which might occur at an airport or reasonably nearby.

13. Accidents in the takeoff and landing phases of aircraft operation frequently do result in greater damage to aircraft than those occurring in flight. However, between 1970 and 1973, only 77 aircraft received more than minor damage either taking off or landing. 6/ In this same period, there were 38,484,634 total takeoffs and landings of U.S. air carriers at United States airports. 7/ This means that, over this three-year period, an aircraft accident occurred involving more than minor damage only once every 499,880 landings and takeoffs. By comparison, there was a total of 327,605 operations performed by all U.S. and foreign commercial air carriers at New York's Kennedy Airport in 1973.

Accidents Involving Large Motor-Carriers

14. a. Truck accidents occur with greater frequency than do aircraft accidents. The Bureau of Motor Carrier Safety of the Federal Highway Administration (FHWA), which is an operating administration within DOT, publishes statistics concerning accidents involving fatal-

6/ Between 1970 and 1974, a total of 112 aircraft were damaged in all phases of operations. However, in this same period U.S. route air carriers flew more than 12 billion miles in all operations.

7/ FAA Statistical Handbook of Aviation, Calendar Year 1973, U.S. Department of Transportation, Federal Aviation Administration (Stock No. 5007-99266).

ities, injuries requiring medical attention, or property damage of $2,000 or more. According to these, large interestate common motor carriers having annual operating revenues of $300,000 or more reported being involved in 30,851 accidents in 1971. During the same year, all reporting large common motor carriers reporting traveled 1,360,038,632 intercity vehicle-miles. This produces an accident rate of 1.22 accidents for each million vehicle-miles. The comparable accident rate for U.S. air carriers in the same year was considerably less — 0.02 accidents per million aircraft-miles. In other words, the large motor carriers on which special nuclear materials might have to be transported in the event of a preliminary injunction had an accident rate 61 times greater than did U.S. air carriers in 1971.

b. In 1972, a total of 36,682 accidents was reported by large motor carriers, which traveled 15,883,103,701 intercity vehicle-miles. In 1972, the accident rate for large motor carriers had increased to 2.31 accidents per million vehicle-miles, while the accident rate for U.S. air carriers remained stationary at 0.02 accidents per million aircraft-miles. This means that in 1972 the accident rate for large motor carriers was 115 times greater than it was for U.S. air carriers.

15. a. That motor carriers of all classes have a higher accident rate than aircraft is also borne out by figures published by the National Safety Council. 8/ According to these, the accident rate for common interstate motor carriers of all sizes was 3.06 accidents per each million vehicle-miles in 1971-1973. The accident rates for private interstate motor carriers was 4.79 for each million vehicle-miles in this period; and, for contract motor carriers, the accident rate was as high as 11.73 accidents for each million vehicle-miles. The accident rate for U.S. route carriers during this period was 0.02 accidents for each million aircraft-miles.

8/ Accident Facts, 1974.

b. Accordingly, in 1971-1973, the accident rate for U.S. route-carrier aircraft was 153 times less than it was for all interstate common motor carriers; 239 times less than it was for private interstate motor carriers; and 586 times less than it was for contract motor carriers.

Railroad Accidents

16. a. The Federal Railroad Administration (FRA), which is an operating administration within DOT, collects information about accidents in which railroads were involved. The FRA requires reports of all railroad accidents involving a fatality, a serious injury, or property damage in the amount of $750 or more. While many of the accidents reported to the FRA do not involve any damage to the train, many others, such as derailments and head-on crashes, produce high degrees of impact which might result in damage to or destruction of the containers required for special nuclear material. Because most railroad crashes are caused by deteriorating tracks and beds, the railroad accident rate has increased and can be expected to increase until all United States trackage has been improved.

b. According to FRA statistics, 9/ the accident rate for railroads was 9.32 accidents for every million train-miles traveled in 1971. The total accident rate for railroads was therefore 517 times greater than the accident rate for U.S. air carriers in 1971.

c. In 1972, railroads were involved in 9.69 accidents for every million train-miles -- an accident rate 510 times greater than that for air carriers. In 1973, the accident rate for railroads had risen to 11.27 accidents per million train-miles, which was 733 times greater than the comparable accident rate for air carriers.

Shipping Accidents

17. Upon information and belief, neither DOT nor any of its operating administrations collects information showing the accident rate of ships and barges or the severity of these accidents which would be comparable to those published by the NTSB, the FHWA and the FRA.

9/ Accident Bulletin: Summary and Analysis of Accidents on Railroads in the United States, Federal Railroad Administration, No. 140, Stock No. 5006-0011 (1971); No. 141, Stock No. 5006-0011 (1972); and No. 142, Stock No. 5005-00008 (1973)..

Reported Incidents Involving
Hazardous Materials

18. All carriers, regardless of mode, are required to report to OHM all incidents involving the transportation of hazardous materials in which, inter alia, fire, breakage, spillage or suspected radioactive contamination occurs involving radioactive materials, including special nuclear materials.

b. In the period 1971-1973, there were 58 reports of suspected release of radioactivity from containers in transportation. Upon investigation, few of these actually resulted in radioactive contamination. It is significant to note than no suspected or actual release of radioactivity resulted from an aircraft accident. Instead, the majority of incidents arise as a result of improper handling of containers, rather than in the transportation phase of movement.

c. There have, however, been instances of accidents involving special nuclear material carried by ground transportation. However, there has been no leakage or any other inadvertent release of radioactivity associated with any of these accidents. Instead, in all such cases, the Type B containers in which special nuclear material is required to be transported withstood the accident forces. In one recent case, a container carrying spent reactor fuel elements - primarily uranium - 235 and mixed fission products - was being transported by truck in Tennessee when the truck overturned. Although the container became detached from the flatbed trailer on which it was carried and skidded over 50 feet, the structural integrity of the container remained unimpaired.

d. In another recent instance, a Type B container carrying uranium hexaflouride fell from a railroad car on which it was being transported and onto the tracks. The train ran over it with sufficient force to derail several cars . The container remained intact, however, and there was no leakage of its contents.

Conclusion

19. I do not regard the risk of leakage or other inadvertent release of radioactivity resulting from an accident involving an aircraft with special nuclear materials aboard to be appreciably large. The safety record of U.S. commercial aviation is excellent, particularly when compared to other modes of transportation, and it is improving constantly. I also believe that present containerization standards for special nuclear materials are sufficient to protect the public under both normal and accident conditions.

Herbert H. Kaiser, Jr.

Herbert H. Kaiser, Jr.

Subscribed and sworn to before me this 29th day of May, 1975.

Harold E. Finney
Notary Public
My commission expires
February 14, 1980

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK, :

-V- Plaintiff : AFFIDAVIT

THE NUCLEAR REGULATORY COMMISSION et.al, : 75 Civ. 2121 WCC

Defendants. :

MONTGOMERY COUNTY)
: SS.:
STATE OF MARYLAND)

Donald A. Nussbaumer, being sworn, deposes and says:

1. I am employed by the United States Nuclear Regulatory Commission ("NRC") as Assistant Director for Materials, Agreements and Transportation, Division of Materials and Fuel Cycle Facility Licensing, and I submit this affidavit in opposition to Plaintiff's motion for a preliminary injunction.

2. I have been employed by the NRC since its inception in January 1975, and by its predecessor agency, the Atomic Energy Commission, since 1955. The Division of Materials and Fuel Cycle Facility Licensing is responsible, among other things, for evaluating proposed package designs for radioactive materials, including special nuclear materials, against NRC regulatory standards and requirements and for approving or denying such designs. By virtue of my education, experience and responsibilities with the NRC, I am qualified as an expert in the subject of container integrity. A summary of my professional qualifications is attached hereto as Exhibit A.

3. I have reviewed the complaint, motions for temporary restraining order and preliminary injunction and supporting affidavits concerning the alleged risks of air transportation of special nuclear material submitted by the plaintiff in this action, particularly those portions pertaining to container integrity. This affidavit and supporting exhibits set forth the basis for my judgment that the containers in which special nuclear materials are transported would survive most aircraft accidents, and that the risk of container rupture as a result of such accidents is very remote. I will describe (1) the history of safety regulations governing transportation of radioactive materials and the consistency of the United States

regulations with the transport standards of the International Atomic Energy Agency (IAEA) which are applied internationally, (2) the care taken to ensure that these containers are properly designed before being approved for use, and (3) the implications of regulatory requirements with regard to container survival in aircraft accidents.

HISTORY OF REGULATORY FRAMEWORK

4. Following a prohibition against shipment of radioactive material by mail in 1936 to protect unexposed film, safety regulations for shipping radioactive material, including special nuclear material, were first adopted by the Interstate Commerce Commission (ICC) in 1948. Those regulations were based on a report of a National Academy of Sciences - National Research Council Subcommittee on Transportation of Radioactive Material.

5. In 1959, the United Nations created the International Atomic Energy Agency ("IAEA") which was entrusted with the formulation of regulatory standards pertaining to the world-wide transportation of radioactive materials, including special nuclear materials. Presently there are approximately 77 member countries of IAEA, including the United States, Canada, France, West and East Germany, Japan, the USSR and the United Kingdom.

6. The basic principles reflected in the ICC regulations were reviewed and adopted, with minor modifications and some elaboration by the IAEA in 1961 and were reflected in recommended International Standards for the Safe Transport of Radioactive Material. In 1964, on the basis of shipping experience up to that date and an analysis of transportation accidents prepared by the United Kingdom Atomic Energy Authority, the IAEA issued revised transport regulations incorporating specific accident damage test standards. These standards were incorporated into the NRC (then the AEC) and Department of Transportation ("DOT") (then ICC) regulations by 1968. Except for changes in the regulations to deal with specific problems (e.g., leak testing of packages containing liquids, prompt pickup and monitoring of packages, restrictions on shipments of plutonium on passenger aircraft, opening and closing procedures), the safety regulations have remained essentially the same since that time.

7. To the best of my knowledge and belief, the IAEA transport regulations have been adopted by every international transportation organization and almost

all of its member-states, including the United States. Accordingly, the packaging standards of the United States for special nuclear materials are consistent with those of most other countries.

8. The safety standards for transportation of special nuclear materials, as set forth in NRC's regulation in 10 CFR Part 71, and DOT regulations 49 CFR Parts 170-178 and 14 CFR Part 103 are based on two main considerations: (1) protection of the public from external radiation and (2) assurance that the contents are unlikely to be released during either normal or accident conditions of transport or, if the container is not designed to withstand accidents, that its contents are so limited in quantity as to preclude a significant radiation safety problem if released. These safety standards are applicable to containers used in all modes of transport and were developed with the objective of providing an acceptable level of safety for transport of radioactive material by any mode.

9. NRC packaging standards are applicable to shipments by NRC licensees, while DOT regulations are applicable to transportation of radioactive material, by land in interstate and foreign commerce, on civil aircraft, and on water. For the purpose of developing and implementing consistent and effective regulations, and to avoid duplication, the DOT (then ICC) and the AEC (NRC's predecessor) entered into a Memorandum of Understanding in 1966 which was superseded by a revised Memorandum of Understanding signed in 1973. Under the revised memorandum, the NRC develops performance standards for container designs for the types of containers at issue in this proceeding. The DOT develops safety standards governing handling and storage of containers of radioactive material while in the possession of a common, contract or private carrier. DOT is the National Competent Authority with respect to foreign shipments under the IAEA transport standards. IAEA Certificates of Competent Authority are issued by DOT, with technical assistance provided by NRC as requested.

10. NRC and DOT regulations governing container integrity were adopted pursuant to public notice and comment procedures provided by the Administrative Procedure Act, 5 U.S.C. 553. Thus, many of the basic safety issues sought to be raised by this proceeding were previously considered in rulemaking proceedings. When the present NRC regulations governing tests for container

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integrity (described in paragraph 14 below) were proposed in 1965, numerous written comments were received from industry and other regulatory agencies, and the plaintiff State of New York. A letter from New York's Atomic Energy Coordinating Council, Committee on Licensing expressed concern about the effect of the proposed regulations on the "Agreement State" licensing program, in which New York is a participant. Although it had full opportunity to do so, New York voiced no concerns about the substance of the proposed regulations. Under New York's Agreement State licensing program, the State presently regulates intrastate shipments of small quantities of special nuclear material, including plutonium. The New York program is described in the accompanying affidavit of G. Wayne Kerr.

NRC REGULATIONS ON CONTAINER INTEGRITY

11. Pursuant to NRC regulations, applicants must obtain prior NRC approval of a proposed container design and in applying for such approvals must submit a detailed safety report containing an evaluation of the container's ability to meet the requirements specified by NRC regulations (10 CFR Part 71). The safety evaluation presents the engineering analysis and/or actual test results upon which the applicant bases his conclusion that the proposed design meets the regulations. To illustrate the scope and detail of the information required, a copy of 10 CFR Part 71 and a draft application format guide are attached hereto as Exhibit B.

12. Upon receipt of this report, the NRC staff undertakes a thorough and detailed technical review. The review requires expertise in the technical disciplines of heat transfer, structural mechanics, and the nuclear physics of criticality and shielding. Only after determining that the applicant has demonstrated that the proposed design meets the regulations will the NRC issue an approval.

13. There are several Type B* container designs currently approved by NRC which

*Type B containers must be designed against both normal and accident test conditions as specified in NRC regulations, and are required for quantities in excess of a few millicuries and up to 20-50,000 curies, depending upon the radionuclide. Smaller quantities may be shipped in Type A containers which must withstand normal test conditions but not accident test conditions. For example, more than 1 millicurie of plutonium (about one two-thousandths of an ounce for plutonium^{239}) must be shipped in a Type B container.

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could be used to ship significant quantities of plutonium oxide or plutonium nitrate by air. From a safety standpoint all of the designs meet the serial container integrity tests described hereafter. Basically, these packages consist of an inner container made from steel pipe having wall thicknesses from 0.18 inch to 0.5 inch depending on the design. The inner container is closed by means of a threaded cap, or bolted flange, and sealed with a gasket. The inner container is centered and supported within an exterior steel drum. The space between the steel drum and the inner container is filled with a thermal insulating and shock absorbing material such as vermiculite, Celotex, or phenolic foam.

14. The regulations prescribe, for Type B containers, a series of tests to assess the adequacy of a proposed design to withstand certain specified hypothetical accident conditions. The tests must be applied sequentially, in the order listed below.

    (1) Impact — a free fall from a height of 30 feet onto an essentially unyielding surface, typically consisting of a steel plate resting on a massive block of reinforced concrete. The container must strike in the position that will produce the most damage.

    (2) Puncture — a free fall from a height of 40 inches onto a solid steel cylinder six inches in diameter and mounted on an essentially unyielding surface. Again, the container must strike the cylinder in the position that will produce the most damage.

    (3) Fire — exposure to a fire at a temperature of 1,475°F. for a period of 30 minutes.

    (4) Water immersion — immersion under at least 3 feet of water for at least 8 hours.

15. Following this test sequence, a container must meet the following performance requirements:

    (1) No release of radioactive material, except for very limited amounts of radioactive gases and contaminated coolant. In the case of plutonium shipments, where radioactive gases and coolant are not involved, no release of radioactivity would be permitted.

    (2) External radiation level must not exceed 1000 mrem/hr at 3 feet from the surface of the package.

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(3) The contents must remain subcritical (i.e., no self-sustaining nuclear chain reaction).

16. Because the tests are sequential, the total effect of the tests on the package is an accumulation of the effect produced by each individual test. That is, after sustaining the effect of impact in a particular area from the test, the container must then have the capability to withstand the succeeding puncture test onto a steel cylinder in the same area, and still have sufficient design integrity to meet the succeeding fire and immersion tests. Therefore, the overall package integrity would be greater than implied by any single test.

ACCIDENT CONDITIONS

17. With reference to actual accident conditions, the applicability of the impact test -- the test most relevant to serious aircraft accidents -- is also enhanced in that the container alone must be tested. In a real transportation accident, it is reasonable to expect that the container impact forces would be mitigated to some degree by the transporting vehicle. In the case of an aircraft accident, the aircraft itself would absorb some of the "kinetic energy" (the product of one-half its mass times its velocity squared) of the package and act to cushion the shock of a crash. This would be especially true for cases involving take-off and landing accidents (the most frequently occurring type of accident which causes substantial aircraft damage) since there is generally a low angle of incidence between the direction of aircraft impact and the surface.

18. This point is illustrated by an instrumented impact test conducted at the Army's Aberdeen Proving Ground. A 15-ton cask was mounted on a semi-trailer truck and the truck was driven into a rigid barrier at 28.5 miles per hour. The cask remained securely mounted on the trailer and was undamaged, but the truck was completely demolished. As part of that same test series, another semi-trailer truck loaded with much smaller containers was driven into the rigid barrier at 42 mph. Several of the drums lost their lids but none of the inner containers was released or broken. About 50% of the drums were undamaged.

19. Another factor enhancing reliability of the NRC impact test is the requirement that the container strike an "essentially unyielding surface." As

noted above, the NRC impact test is performed by dropping the container onto a steel plate resting on a massive block of reinforced concrete. Before a moving object can come to rest, its "kinetic energy" must be completely dissipated. The two principal means by which a shipping container can dissipate its kinetic energy upon impact (in addition to absorption by the transporting vehicle and the tie-down system) are:

(1) by crushing or deforming the container itself; and (2) by deforming or displacing the impact surface. The "essentially unyielding surface" requirement increases the damage done to the container in two ways:

(a) It reduces the amount of the kinetic energy of the container that would otherwise be absorbed by the impact surface, forcing the container to absorb essentially all of the kinetic energy itself. This results in more severe damage to the container than would result from impact on a less rigid surface.

(b) The rate of deceleration (commonly called "g-loads") experienced by container impact onto an essentially unyielding target is higher than cases in which impact occurs on a less rigid surface. For example, if the container were to strike a surface such as soil or an asphalt pavement, the impact would not produce g-loads as high as would be produced by a hard surface, such as a granite outcropping.

20. Most air accidents would not involve container impact onto a surface comparable to the NRC test requirement of an "essentially unyielding target." A two-year long statistical study of the severities of cargo aircraft accidents was undertaken by Sandia Laboratories, Albuquerque, New Mexico. Sandia Laboratories is a non-profit subsidiary of Western Electric of the Bell System. They are engaged primarily in contract work for the Energy Research and Development Administration but also do work for other Government agencies. Sandia has extensive experience in the development and testing of nuclear weapons as well as the containers used to ship these weapons. Sandia maintains extensive test facilities which can duplicate various environmental conditions and has conducted extensive testing and analysis of containers used to transport other radioactive materials. In the study, Sandia

researched and analyzed data available from several hundred actual civilian and military cargo aircraft accidents to determine the external environment that would be experienced by a shipping container during an accident and to estimate the probability and frequency that an accident environment of given severity would occur. A copy of the preliminary results of this study, which was published for comment in January 1974 is attached hereto as Exhibit C. The study divided accidents into two groups -- those occurring on the runway and those occurring on other surfaces; 26% were found to have occurred on the runway, 19% were found to have occurred near the runway (e.g., over and undershoots). Apart from runway accidents, the Sandia study showed the calculated probability of various surfaces under flight paths between major United States air traffic centers, as follows:

Surface Type		Probability
Water	Water, marsh	18%
Soft Soil	Sand, cultivated soil	28%
Hard Soil	Partially consolidated clay	40%
Soft Rock	Tuff, alluvium, sandstone	9%
Hard Rock	Granite, gneiss	5%

21. The same Sandia study also concluded that an aircraft accident producing an impact on a container equivalent to that produced by the NRC impact test can be expected to occur no more frequently than once in about 475 million aircraft miles. Given that an aircraft accident occurs, the NRC impact test would not be exceeded in about 78% of all aircraft accidents. Taking into account the relatively limited extent to which significant quantities of special nuclear material are presently transported by air (see affidavits of Leland Rouse and G. Wayne Kerr), the likelihood of such an accident is, in my judgment, extremely remote.

22. The plaintiff's supporting affidavit by Dr. Resnikoff discusses two mechanisms (crush and puncture) other than impact which could cause failure of a container. While his contention that it is possible to cause container failure by a sufficiently severe test mechanism of this sort is true, the Sandia study indicates that crush and puncture environments are not frequently produced by aircraft accidents. The estimated probability that an aircraft accident will produce a puncture environment more severe than that specified in the regulations is reported to be 2.6%. The Sandia

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study also estimates that a crush environment would not be produced by 97% of all aircraft accidents. While it is not inconceivable that container failure due to crush or puncture could result from an aircraft accident, the indicated probability of such an occurrence is low.

23. Another possible mechanism for container failure in an aircraft accident is fire damage. The Sandia study indicates that 65% of all aircraft accidents will not result in a fire. Of those that do, only 30% are reported to produce a more severe condition than that prescribed in the regulations. The report indicates that such a condition would be expected to occur no more frequently than once in about 950 million aircraft miles. Or, given that an aircraft accident occurs, the regulatory fire test condition would not be exceeded in approximately 89% of all accidents.

24. In another series of tests by Sandia Laboratories, it was shown that containers used for transporting plutonium can survive even more severe accident conditions than required by NRC standards. In these tests three container designs which could be used for air shipment of plutonium (with liquid contents for test purposes) were subjected to impact tests more severe than required by NRC standards. The three packages each had a different shock absorbing material in the space between the outer drum and the inner container. The packages were dropped onto a flat concrete surface at a velocity of 130 feet per second (equivalent to a free fall from a height of 260 feet -- almost 9 times the drop height prescribed in the NRC regulation). The tests demonstrated the ability of the package designs to retain their contents when subjected to the severe tests. A document describing these Sandia tests in detail is attached hereto as Exhibit D.

25. In view of the possible increase in the shipment of plutonium and to provide greater protection, the Commission has recently issued an effective rule which requires that plutonium in quantities greater than 20 curies in a dispersible form must be shipped as a solid. In addition, packages must provide for double containment of the contents such that both containment barriers in the packaging maintain their integrity under normal and accident test conditions. This will result in higher integrity packaging for plutonium and thus provides greater assurance of containment over previous requirements. To allow appropriate time for implementation, these requirements must be met by June 17, 1978.

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26. In conclusion, NRC-approved container designs are high integrity containers which possess the ability to resist severe impact and fire environments without releasing their radioactive contents. While the exact degree of reserve margin is impossible to quantify, containers used to transport special nuclear materials can meet the regulatory requirements with some degree of reserve margin. Taking account of relevant variables, including the high integrity of the containers, the infrequency of serious aircraft accidents, and the relatively small number of air shipments of special nuclear material, I believe that the risk of an aircraft accident resulting in container failure and subsequent release of special nuclear material is very slight.

Donald A. Nussbaumer

Donald A. Nussbaumer

Subscribed and sworn to
before me this 29th day
of May, 1975

Carol J. Durham

Notary Public

My commission expires July 1, 1978.

Exhibit A

PROFESSIONAL QUALIFICATIONS
OF
DONALD A. NUSSBAUMER

U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

Education

BS	Chemistry-biology	Union College, Schenectady, N.Y.	1950
1 Yr. Graduate Work	Biochemistry	Cornell University, New York, N.Y.	1951

Experience

1974 to date — Assistant Director for Materials, Agreements and Transportation, Division of Materials and Fuel Cycle Facility Licensing, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission

Plan, direct and manage the licensing program for use of atomic energy materials carried out by the Materials Branch, the program for State Agreements and the licensing program for the export of nuclear materials and facilities carried out by the Agreements and Exports Branch, and the licensing program for evaluation of package designs for radioactive materials transport carried out by the Transportation Branch. Activities include: the licensing of byproduct, source and special nuclear materials in a manner which protects public health and safety; the development and administration of a program of entering into Agreements with States for the transfer of NRC regulatory authority over byproduct, source and special nuclear materials as provided by the Atomic Energy Act (Section 274); the determination on a continuing basis that Agreement State programs are adequate to protect the public health and safety and are compatible with the NRC regulatory programs for such materials; the assessment of environmental impact of

activities as required by 10 CFR 51 which implements the National Environmental Policy Act; and the evaluation and approval (through licensing or certification) of all package designs (requiring prior approval) for transport of radioactive materials.

1972-1974 Assistant Director for Fuel Cycle - Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Plan, direct and supervise nonreactor fuel cycle licensing activities of the AEC Regulatory program as carried out by the following Branches - Fuel Fabrication and Reprocessing, and Materials and Plant Protection. Activities include licensing review of nonreactor production and utilization facilities, including their operators, licensing review of special nuclear material in quantities greater than a critical mass, licensing review of source material for uranium milling and UF_6 production, and evaluating of controls for safeguarding strategically important nuclear materials against diversion and protection of plants and materials against acts of sabotage.

1970-1972 Chief, Fuel Fabrication and Transportation Branch
Division of Materials Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Administer the technical evaluation and processing to final action all applications for and communications concerning licenses for special nuclear material in quantities greater than a critical mass. Administer the evaluation and approval of proposed designs of shipping casks for transportation of irradiated reactor fuel elements and other radioactive material from the standpoint of their adequacy to comply with regulatory standards.

1961-1970 Chief, Source and Special Nuclear Materials Branch
Division of Material Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Administer the technical evaluation and processing to final action of all applications for and communications concerning licenses for source material and special nuclear material.

1957-1961 Radiation Safety Specialist
Division of Licensing and Regulations
U.S. Atomic Energy Commission
Washington, D.C. 20545

Evaluation of potential radiation hazards associated with the use, storage, disposal, and transport of radioactive materials and the adequacy of engineering and administrative controls to protect against such hazards. Assists in the development of criteria, standards and operating procedures in radiation protection for use in establishing regulations and evaluating license applications.

1955-1957 Field Representative
Oak Ridge Operations Office
U.S. Atomic Energy Commission
Oak Ridge, Tennessee

Visited firms and institutions licensed by the AEC to use radioisotopes. Advised radioisotope users concerning special radiation protection problems involving shielding, monitoring, instrumentation, laboratory design, ventilation and waste disposal. Checked programs to determine compliance with proper radiation safety practices.

1951-1955 Senior Health Physics Inspector
Knolls Atomic Power Laboratory
General Electric Company
Schenectady, New York

Health physics responsibilities in environmental monitoring, chemical processing of irradiated uranium, radiochemical research laboratories. Also health physics responsibilities in

reactor design, startup, operation and refueling. Duties included evaluation of facility and equipment design, radiation monitoring, and establishing administrative controls for radiation safety.

Exhibit B

PART 71

PACKAGING OF RADIOACTIVE MATERIAL FOR TRANSPORT AND TRANSPORTATION OF RADIOACTIVE MATERIAL UNDER CERTAIN CONDITIONS*

Subpart A—General Provisions

Sec.
71.1 Purpose.
71.2 Scope.
71.3 Requirement for license.
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§ 71.1 Purpose.

(a) This part establishes requirements for transportation and for preparation for shipment of licensed material and prescribes procedures and standards for approval by the Atomic Energy Commission of packaging and shipping procedures for fissile material (uranium-233, uranium-235, plutonium-238, plutonium-239, and plutonium-241) and for quantities of licensed materials in excess of type A quantities, as defined in § 71.4(q), and prescribes certain requirements governing such packaging and shipping.

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(b) The packaging and transport of these materials are also subject to other parts of this chapter and to the regulations of other agencies having jurisdiction over means of transport. The requirements of this part are in addition to, and not in substitution for, other requirements.

§ 71.2 Scope.

The regulations in this part apply to each person authorized by specific license issued by the Commission to receive, possess, use, or transfer licensed materials, if he delivers such materials to a carrier for transport or transports such material outside the confines of his plant or other place of use.

§ 71.3 Requirement for license.

No licensee subject to the regulations in this part shall (a) deliver any licensed materials to a carrier for transport or (b) transport licensed material except as authorized in a general license or specific license issued by the Commission, or as exempted in this part.

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§ 71.4 Definitions.

As used in this part:

(a) "Carrier" means any person engaged in the transportation of passengers or property, as common, contract, or private carrier, or freight forwarder, as those terms are used in the Interstate Commerce Act, as amended, or the U.S. Post Office;

(b) "Close reflection by water" means immediate contact by water of sufficient thickness to reflect a maximum number of neutrons;

(c) "Containment vessel" means the receptacle on which principal reliance is placed to retain the radioactive material during transport;

*Amended 37 FR 3985.

33 FR 17621

(d) "Fissile classification" means classification of a package or shipment of fissile materials according to the controls needed to provide nuclear criticality safety during transportation as follows:

(1) Fissile Class I: Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(2) Fissile Class II: Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(3) Fissile Class III: Shipments of packages which do not meet the requirements of Fissile Classes I or II and which are controlled in transportation by special arrangements between the shipper and the carrier to provide nuclear criticality safety.

(e) "Fissile materials" means uranium 233, uranium 235, plutonium 238, plutonium 239, and plutonium 241;

(f) "Large quantity" means a quantity of radioactive material, the aggregate radioactivity of which exceeds any one of the following:

(1) For transport groups as defined in paragraph (p) of this section:

(i) Group I or II radionuclides: 20 curies;

(ii) Group III or IV radionuclides: 200 curies;

(iii) Group V radionuclides: 5,000 curies;

(iv) Group VI or VII radionuclides: 50,000 curies;

and

(2) For special form material as defined in paragraph (o) of this section: 5,000 curies.

(g) "Low specific activity material" means any of the following:

(1) Uranium or thorium ores and physical or chemical concentrates of those ores;

(2) Unirradiated natural or depleted uranium or unirradiated natural thorium;

(3) Tritium oxide in aqueous solutions provided the concentration does not exceed 5.0 millicuries per milliliter;

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300

(4) Material in which the activity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

(i) 0.0001 millicurie of Group I radionuclides; or

(ii) 0.005 millicurie of Group II radionuclides; or

(iii) 0.3 millicurie of Groups III or IV radionuclides.

NOTE: This includes, but is not limited to, materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper, and cardboard; solid or liquid plant waste, sludges, and ashes.

(5) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination, when averaged over an area of 1 square meter, does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,200,000 disintegrations per minute) per square centimeter of other radionuclides.

(h) "Maximum normal operating pressure" means the maximum gauge pressure which is expected to develop in the containment vessel under the normal conditions of transport specified in Appendix A of this part;

(i) "Moderator" means a material used to reduce, by scattering collisions and without appreciable capture, the kinetic energy of neutrons;

(j) "Optimum interspersed hydrogenous moderation" means the occurrence of hydrogenous material between containment vessels to such an extent that the maximum nuclear reactivity results;

(k) "Package" means packaging and its radioactive contents;

(l) "Packaging" means one or more receptacles and wrappers and their contents excluding fissile material and other radioactive material, but including absorbent material, spacing structures, thermal insulation, radiation shielding, devices for cooling and for absorbing mechanical shock, external fittings, neutron moderators, nonfissile neutron absorbers, and other supplementary equipment;

(m) "Primary coolant" means a gas, liquid, or solid, or combination of them, in contact with the radioactive material or, if the material is in special form, in contact with its capsule, and used to remove decay heat;

(n) "Sample package" means a package which is fabricated, packed, and closed to fairly represent the proposed package as it would be presented for transport, simulating the material to be transported, as to weight and physical and chemical form;

(o) "Special form" means any of the following physical forms of licensed material of any transport group:

(1) The material is in solid form having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters; does not melt, sublime, or ignite in air at a temperature of 1,000° F.; will not shatter or crumble if subjected to the percussion test described in Appendix D of this part; and is not dissolved or converted into dispersible form to the extent of more than 0.005 percent by weight by immersion for 1 week in water at 68° F. or in air at 86° F.; or

(2) The material is securely contained in a capsule having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters, which will retain its contents if subjected to the tests prescribed in Appendix D of this part; and which is constructed of materials which do not melt, sublime, or ignite in air at 1,475° F., and do not dissolve or convert into dispersible form to the extent of more than 0.005 percent by weight by immersion for 1 week in water at 68° F. or in air at 86° F.

(p) "Transport group" means any one of seven groups into which radionuclides in normal form are classified, according to their toxicity and their relative potential hazard in transport, in Appendix C of this part.

(1) Any radionuclide not specifically listed in one of the groups in Appendix C shall be assigned to one of the Groups in accordance with the following table:

Radionuclide	Radioactive half-life		
	0 to 1000 days	1000 days to 10^8 years	Over 10^8 years
Atomic number 1–81.	Group III....	Group II.....	Group III.
Atomic number 82 and over.	Group I.....	Group I.....	Group III.

(2) For mixtures of radionuclides the following shall apply:

(i) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.

(ii) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(iii) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(iv) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except that if a radionuclide "x" has a half-life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during transportation, the transport group of the nuclide "x" and the activity of the mixture shall be the maximum activity of that nuclide "x" during transportation.

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Terms defined in Parts 20, 30 to 36 inclusive, and 70 of this chapter have the same meaning when used in this part.

(c) "Type A quantity" and "type B quantity" means a quantity of radioactive material the aggregate radioactivity of which does not exceed that specified in the following table:

Transport groups [see § 71.4(p)]	Type A quantity (in curies)	Type B quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	200
V	20	5,000
VI and VII	1,000	50,000
Special form	[1] 20	5,000

[1] Except that for californium-252, the limit is 2 Ci.

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§ 71.5 Transportation of licensed material.

(a) No licensee shall transport any licensed material outside of the confines of his plant or other place of use, or deliver any licensed material to a carrier for transport, unless the licensee complies with the applicable requirements of the regulations appropriate to the mode of transport, of the Department of Transportation in 49 CFR Parts 170–189, 14 CFR Part 103 and 46 Part 146, and the U.S. Postal Service in 39 CFR Parts 14 and 15 insofar as such regulations relate to the packaging of byproduct, source, or special nuclear material, marking and labeling of the packages, loading and storage of packages, placarding of the transportation vehicle, monitoring requirements and accident reporting.

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(b) When Department of Transportation regulations are not applicable to shipments of licensed material by rail, highway, or water because the shipment or the transportation of the shipment is not in interstate or foreign commerce, or to shipments of licensed material by air because the shipment is not transported in civil aircraft, the licensee shall conform to the standards and requirements of the Department of Transportation specified in paragraph (a) of this section, to the same extent as if the shipment or transportation were in interstate or foreign commerce or in civil aircraft. Any requests for modifications, waivers, or exemptions from those requirements, and any notifications referred to in those requirements shall be filed with, or made to, the Atomic Energy Commission.

(c) Paragraph (a) of this section shall not apply to the transportation of licensed material, or to the delivery of licensed material to a carrier for transport, where such transportation is subject to the regulations of the Department of Transportation or the U.S. Postal Service.

EXEMPTIONS

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§ 71.6¶ Specific exemptions.

On application of any interested person or on its own initiative, the Commission may grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security.

¶Redesignated by 38 FR 10437.

33 FR 17621

37 FR 3985

§ 71.7* Exemption for no more than Type A quantities.†

A licensee is exempt from all the requirements of this part to the extent that he delivers to a carrier for transport:

(a) Packages each of which contains no licensed material having a specific activity in excess of 0.002 microcurie/gram; or

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(b) Shipments subject to the regulations of the Department of Transportation in 49 CFR parts 170–189, 14 CFR part 103, or 46 CFR part 146 or the U.S. Postal Service in 39 CFR parts 14 and 15 of packages each of which contains no more than a type A quantity of radioactive material, as defined in § 71.4(q), which may include one of the following:

(1) Not more than 15 grams of fissile material; or

(2) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material; or

(3) Uranium compounds, other than metal (e.g., UF_4, UF_6, or uranium oxide in bulk form, not pelletted or fabricated into shapes) or aqueous[1] solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0‡ percent by weight of the uranium-235 content, and the total fissile content does not exceed 1.00‡ percent by weight of the total uranium content; or

(4) Homogeneous hydrogenous[2] solutions or mixtures containing not more than:

(i) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or

(ii) 800 grams of uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1 percent by weight of the total uranium-235 content; or

(iii) 500 grams of uranium-233 and uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium is not more than 1 percent by weight of the total uranium-233 and uranium-235 content; or

(5) Less than 350 grams of fissile material: *Provided*, That there is not more than 5 grams of fissile material in any cubic foot within the package.

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§ 71.8* Exemption of physicians.

Physicians, as defined in § 35.3(b) of this chapter, are exempt from the regulations in this part to the extent that they transport licensed material for use in the practice of medicine.

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§ 71.9 Exemption for fissile material.

A licensee is exempt from requirements in §§ 71.33, 71.35(b), 71.36(b), 71.37, 71.38, 71.39, and 71.40 to the extent that he delivers to a carrier for transport packages each of which contains one of the following:

(a) Not more than 15 grams of fissile material; or

(b) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material; or

(c) Uranium compounds, other than metal (e.g., UF_4, UF_6, or uranium oxide in bulk form, not pelletted or fabricated into shapes) or aqueous[1] solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0‡ percent by weight of the uranium-235 content, and the total fissile content does not exceed 1.00‡ percent by weight of the total uranium content; or

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(d) Homogeneous hydrogenous[2] solutions or mixtures containing not more than:

(1) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or

(2) 800 grams of uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1 percent by weight of the total uranium-235 content; or

(3) 500 grams of uranium-233 and uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium is not more than 1 percent by weight of the total uranium-233 and uranium-235 content; or

(e) Less than 350 grams of fissile material: *Provided*, That there is not more than 5 grams of fissile material in any cubic foot within the package.

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§ 71.10 Limited exemption for shipment of type B quantities of radioactive material.

A person delivering a type B quantity of radioactive material, as defined in § 71.4(q), to a carrier for transport in accordance with the provisions of a special permit, which has been issued by the Department of Transportation and is in effect on June 30, 1973, is exempt from the requirements in this part with respect to such shipments. The exemption granted by this section shall terminate on December 31, 1973, or on the date on which the DOT special permit expires, whichever is later, except as to activities described both in the special permit and in an application for a license which the person has, prior to the termination date of the exemption, filed with the Commission. If the person has filed such an application, the exemption granted by this section shall continue until the application has been finally determined by the Commission.

GENERAL LICENSES¶

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§ 71.11* General license for shipment of licensed material.

A general license is hereby issued, to persons holding specific licenses issued pursuant to this chapter, to deliver licensed material to a carrier for transport, without complying with the package standards of Subpart C of this part, when either:

(a) The material is shipped as a Fissile Class III shipment with the following limitations on its contents:

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(1) No single package contains more than a type A quantity of radioactive material, as defined in § 71.4(q); and

(2) The fissile material contents of the shipment do not exceed:

(i) 500 grams of uranium 235; or

(ii) 300 grams total of uranium 233, plutonium 238, plutonium 239, and plutonium 241; or

(iii) Any combination of uranium 233, uranium 235, and plutonium in such quantities that the sum of the ratios of the quantity of each of them to the quantity specified in subdivisions (i) and (ii) of this subparagraph does not exceed unity; or

(iv) 2500 grams of plutonium 238, plutonium 239, and plutonium 241 encapsulated as plutonium-beryllium neutron sources, with no one package containing in excess of 400 grams of plutonium 238, plutonium 239, and plutonium 241; or

(b) The material is shipped as Fissile Class II packages with the following limitations on the contents of each package:

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(1) No single package contains more than a type A quantity of radioactive material, as defined in § 71.4(q); and

(2) No package contains fissile material in excess of the amounts specified in the following table, and each package is labeled with the corresponding transport index:

Maximum quantity of fissile material a single package				Corresponding transport index
U-235 (grams)	U-233 (grams)	Plutonium (grams)	Plutonium as Pu-Be neutron sources (grams)	
35–40	27–30	23–25	320–400	10
30–35	24–27	21–23	240–320	8
25–30	21–24	19–21	160–240	6
20–25	18–21	17–19	80–160	4
15–20	15–18	15–17	15–80	2

NOTE. Combinations of fissile materials are authorized. For combinations of fissile materials, the transport index is the sum of the individual corresponding transport indexes. The total transport index shall not exceed 10.

*Redesignated by 38 FR 10437.
†Amended by 38 FR 10437.
[1] This applies to light water and does not apply to heavy water.
[2] This applies to light hydrogen and does not apply to heavy hydrogen (i.e., deuterium or tritium).
‡As corrected by 38 FR 16347.
¶Added by 38 FR 10437.

39 FR 22131 — 35 FR 6271 — 38 FR 10437

§ 71.12 General license for shipment in DOT specification containers, in packages approved for use by another person, and in packages approved by a foreign national competent authority.

A general license is hereby issued, to persons holding a general or specific license issued pursuant to this chapter, to deliver licensed material to a carrier for transport:

(a) In a specification container for fissile material as specified in § 173.396 (b) or (c) or for a type B quantity of radioactive material as specified in § 173.394(b) or § 173.395(b), or for a large quantity of radioactive material as specified in § 173.394(c) or § 173.395(c) of the regulations of the Department of Transportation, 49 CFR part 173; or

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(b) In a package for which a license, certificate of compliance or other approval has been issued by the Commission's Directorate of Licensing, provided that:

(1) The person using a package pursuant to the general license provided by this paragraph:

(i) Has a copy of the specific license, certificate of compliance, or other approval authorizing use of the package and all documents referred to in the license, certificate, or other approval, as applicable;

(ii) Complies with the terms and conditions of the license, certificate, or other approval, as applicable, and the applicable requirements of this part; and

(iii) Prior to first use of the package submits in writing to the Directorate of Licensing, his name and license number, the name and license or certificate number of the person to whom the package approval has been issued, and the package identification number specified in the package approval.

(2) The package approval authorizes use of the package under general license provided in this paragraph.

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(c) In a package which meets the pertinent requirements in the 1967 regulations of the International Atomic Energy Agency and the use of which has been approved in a foreign national competent authority certificate which has been revalidated by the Department of Transportation. *Provided*, That the person using a package pursuant to the general license provided by this paragraph:

(1) Has and complies with the applicable certificate, the revalidation, and the documents referenced in the certificate relative to the use and maintenance of the packaging, and the actions to be taken prior to shipment; and

(2) Complies with the applicable requirements of this part, and of the Department of Transportation regulations in 49 CFR part 173, 14 CFR part 103, and 46 CFR part 146.

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§ 71.13† Communications.

All communications concerning the regulations in this part should be addressed to the Atomic Energy Commission, Washington, D.C. 20545, Attention:

Director of Licensing,‡

or may be delivered in person at the Commission's offices at 1717 H Street NW., Washington, D.C., its offices at Germantown, Md., or its offices at *7920 Norfolk Avenue, Bethesda, Md.

§ 71.14† Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by an officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding on the Commission.

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§ 71.15† Additional requirements.

The Commission may by rule, regulation, or order impose upon any licensee such requirements, in addition to those established in this part, as it deems necessary or appropriate to protect health or to minimize danger to life or property.

37 FR 3985

§ 71.16¶ Amendment of existing licenses.

(a) AEC licenses issued pursuant to this part and in effect on October 4, 1968, which authorize Fissile Class II packages are hereby amended by increasing the minimum number of units specified for each Fissile Class II package by a factor of 1.25. The new number shall be rounded up to the first decimal. In addition, the term "radiation units" is changed to "transport index" wherever used in the license.

(b) The reference to § 71.7(b) in AEC licenses issued pursuant to this part prior to (the effective date of this amendment) is changed to § 71.9(b).

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(c) The reference to § 71.9(b) in AEC licenses issued pursuant to this part prior to June 30, 1973, is changed to 71.12(b).

*Amended 34 FR 19546.
†Redesignated by 38 FR 10437.
‡Amended by 38 FR 1271.
¶Amended 37 FR 3985.

Subpart B—License Applications

§ 71.21 Contents of application.

An application for a specific license under this part may be submitted as an application for a license or license amendment under this chapter and shall include, for each proposed packaging design and method of transport, the following information in addition to any otherwise required:

(a) A package description as required by § 71.22;

(b) A package evaluation as required by § 71.23;

(c) A description of proposed procedural controls as required by § 71.24;

(d) In the case of fissile material, an identification of the proposed fissile class.

§ 71.22 Package description.

The application shall include a description of the proposed package in sufficient detail to identify the package accurately and to provide a sufficient basis for evaluation of the packaging. The description should include:

(a) With respect to the packaging:

(1) Gross weight;

(2) Model number;

(3) Specific materials of construction, weights, dimensions, and fabrication methods of:

(i) Receptacles, identifying the one which is considered to be the containment vessel;

(ii) Materials specifically used as non-fissile neutron absorbers or moderators;

(iii) Internal and external structures supporting or protecting receptacles;

(iv) Valves, sampling ports, lifting devices, and tie-down devices;

(v) Structural and mechanical means for the transfer and dissipation of heat; and

(4) Identification and volumes of any coolants and of receptacles containing coolant.

(b) With respect to the contents of the package:

(1) Identification and maximum radioactivity of radioactive constituents;

(2) Identification and maximum quantities of fissile constituents;

(3) Chemical and physical form;

(4) Extent of reflection, the amount and identity of non-fissile neutron absorbers in the fissile constitutents, and the atomic ratio of moderator to fissile constituents;

(5) Maximum weight; and

(6) Maximum amount of decay heat.

§ 71.23 Package evaluation.

The applicant shall:

(a) Demonstrate that the package satisfies the standards specified in Subpart C;

(b) For a Fissile Class II package, ascertain and specify the number of similar packages which may be transported together in accordance with § 71.39; and

(c) For a Fissile Class III shipment, describe any proposed special controls and precautions to be exercised during transport, loading, unloading, and handling, and in the event of accident or delay.

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§ 71.24 Procedural controls.

The applicant shall describe the regular and periodic inspection procedures proposed to comply with § 71.51(c).

37 FR 3585

§ 71.25 Additional information.

The Commission may at any time require further information in order to enable it to determine whether a license, certificate of compliance, or other approval should be granted, denied, modified, suspended, or revoked.

39 FR 22131

Subpart C—Package Standards

§ 71.31 General standards for all packaging.

(a) Packaging shall be of such materials and construction that there will be no significant chemical, galvanic, or other reaction among the packaging components, or between the packaging components and the package contents.

(b) Packaging shall be equipped with a positive closure which will prevent inadvertent opening.

(c) Lifting devices:

(1) If there is a system of lifting devices which is a structural part of the package, the system shall be capable of supporting three times the weight of the loaded package without generating stress in any material of the packaging in excess of its yield strength.

(2) If there is a system of lifting devices which is a structural part only of the lid, the system shall be capable of supporting three times the weight of the lid and any attachments without generating stress in any material of the lid in excess of its yield strength.

(3) If there is a structural part of the package which could be employed to lift the package and which does not comply with subparagraph (1) of this paragraph, the part shall be securely covered or locked during transport in such a manner as to prevent its use for that purpose.

(4) Each lifting device which is a structural part of the package shall be so designed that failure of the device under excessive load would not impair the containment or shielding properties of the package.

(d) Tie-down devices:

(1) If there is a system of tie-down devices which is a structural part of the package, the system shall be capable of withstanding, without generating stress in any material of the package in excess of its yield strength, a static force applied to the center of gravity of the package having a vertical component of two times the weight of the package with its contents, a horizontal component along the direction in which the vehicle travels of 10 times the weight of the package with its contents, and a horizontal component in the transverse direction of 5 times the weight of the package with its contents.

(2) If there is a structural part of the package which could be employed to tie the package down and which does not comply with subparagraph (1) of this paragraph, the part shall be securely covered or locked during transport in such a manner as to prevent its use for that purpose.

(3) Each tie-down device which is a structural part of the package shall be so designed that failure of the device under excessive load would not impair the ability of the package to meet other requirements of this subpart.

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§ 71.32 Structural standards for type B and large quantity packaging.

Packaging used to ship a type B or a large quantity of radioactive material, as defined in § 71.4 (q) and (f), shall be designed and constructed in accordance with the structural standards of this section.

Standards different from those specified in this section may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

(a) *Load resistance.* Regarded as a simple beam supported at its ends along any major axis, packaging shall be capable of withstanding a static load, normal to and uniformly distributed along its length, equal to 5 times its fully loaded weight, without generating stress in any material of the packaging in excess of its yield strength.

(b) *External pressure.* Packaging shall be adequate to assure that the containment vessel will suffer no loss of contents if subjected to an external pressure of 25 pounds per square inch gauge.

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§ 71.33 Criticality standards for fissile material packages.

(a) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that it would be subcritical if it is assumed that water leaks into the containment vessel, and:

(1) Water moderation of the contents occurs to the most reactive credible extent consistent with the chemical and physical form of the contents; and

(2) The containment vessel is fully reflected on all sides by water.

(b) A package used for the shipment of fissile material shall be so designed

and constructed and its contents so limited that it would be subcritical if it is assumed that any contents of the package which are liquid during normal transport leak out of the containment vessel, and that the fissile material is then:

(1) In the most reactive credible configuration consistent with the chemical and physical form of the material;

(2) Moderated by water outside of the containment vessel to the most reactive credible extent; and

(3) Fully reflected on all sides by water.

(c) The Commission may approve exceptions to the requirements of this section where the containment vessel incorporates special design features which would preclude leakage of liquids in spite of any single packaging error and appropriate measures are taken before each shipment to verify the leak tightness of each containment vessel.

§ 71.34 Evaluation of a single package.

(a) The effect of the transport environment on the safety of any single package of radioactive material shall be evaluated as follows:

(1) The ability of a package to withstand conditions likely to occur in normal transport shall be assessed by subjecting a sample package or scale model, by test or other assessment, to the normal conditions of transport as specified in § 71.35; and

(2) The effect on a package of conditions likely to occur in an accident shall be assessed by subjecting a sample package or scale model, by test or other assessment, to the hypothetical accident conditions as specified in § 71.36.

(b) Taking into account controls to be exercised by the shipper, the Commission may permit the shipment to be evaluated together with or without the transporting vehicle, for the purpose of one or more tests.

(c) Normal conditions of transport and hypothetical accident conditions different from those specified in § 71.35 and § 71.36 may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

§ 71.35 Standards for normal conditions of transport for a single package.

(a) A package used for the shipment of fissile material or more than a type A quantity of radioactive material, as defined in § 71.4(q), shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in appendix A of this part:

(1) There will be no release of radioactive material from the containment vessel;

(2) The effectiveness of the packaging will not be substantially reduced;

(3) There will be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package;

(4) Radioactive contamination of the liquid or gaseous primary coolant will not exceed 10^{-4} curies of activity of Group I radionuclides per milliliter, 5×10^{-4} curies of activity of Group II radionuclides per milliliter, 3×10^{-4} curies of activity of Group III and Group IV radionuclides per milliliter; and

(5) There will be no loss of coolant.

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in Appendix A of this part:

(1) The package will be subcritical;

(2) The geometric form of the package contents would not be substantially altered;

(3) There will be no leakage of water into the containment vessel. This requirement need not be met if, in the evaluation of undamaged packages under § 71.38(a), § 71.39(a)(1), or § 71.40(a), it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material; and

(4) There will be no substantial reduction in the effectiveness of the packaging, including:

(i) Reduction by more than 5 percent in the total effective volume of the packaging on which nuclear safety is assessed;

(ii) Reduction by more than 5 percent in the effective spacing on which nuclear safety is assessed, between the center of the containment vessel and the outer surface of the packaging; or

(iii) Occurrence of any aperture in the outer surface of the packaging large enough to permit the entry of a 4-inch cube.

(c) A package used for the shipment of more than a type A quantity of radioactive material, as defined in § 71.4(q), shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in appendix A of this part, the containment vessel would not be vented directly to the atmosphere.

§ 71.36 Standards for hypothetical accident conditions for a single package.

(a) A package used for the shipment of more than a type A quantity of radioactive material, as defined in § 71.4(q), shall be so designed and constructed and its contents so limited that if subjected to the hypothetical accident conditions specified in appendix B of this part as the free drop, puncture, thermal, and water immersion conditions in the sequence listed in appendix B, it will meet the following conditions:

(1) The reduction of shielding would not be sufficient to increase the external radiation dose rate to more than 1,000 millirems per hour at 3 feet from the external surface of the package.

(2) No radioactive material would be released from the package except for gases and contaminated coolant containing total radioactivity exceeding neither:

(i) 0.1 percent of the total radioactivity of the package contents; nor

(ii) 0.01 curie of Group I radionuclides, 0.5 curie of Group II radionuclides, 10 curies of Group III radionuclides, 10 curies of Group IV radionuclides, and 1,000 curies of inert gases irrespective of transport group.

A package need not satisfy the requirements of this paragraph if it contains only low specific activity materials, as defined in § 71.4(g), and is transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that if subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Puncture, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, the package would be subcritical. In determining whether this standard is satisfied, it shall be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package and the chemical and physical form of the contents;

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents; and

(3) There is reflection by water on all sides and as close as is consistent with the damaged condition of the package.

§ 71.37 Evaluation of an array of packages of fissile material.

(a) The effect of the transport environment on the nuclear safety of an array of packages of fissile material shall be evaluated by subjecting a sample package or a scale model, by test or other assessment, to the hypothetical accident conditions specified in § 71.38, § 71.39, or § 71.40 for the proposed fissile class, and by assuming that each package in the array is damaged to the same extent as the sample package or scale model. In the case of a Fissile Class III shipment, the Commission may, taking into account controls to be exercised by the shipper, permit the shipment to be evaluated as a whole rather than as individual packages, and either with or without the transporting vehicle, for the purpose of one or more tests.

(b) In determining whether the standards of §§ 71.38(b), 71.39(a)(2), and 71.40(b) are satisfied, it shall be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package, the chemical and physical form of the contents, and controls exercised over the number of packages to be transported together; and

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents.

§ 71.38 Specific standards for a Fissile Class I package.

A Fissile Class I package shall be so designed and constructed and its contents so limited that:

(a) Any number of such undamaged packages would be subcritical in any arrangement, and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered; and

(b) Two hundred fifty such packages would be subcritical in any arrangement, if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered. The condition of the package shall be assumed to be as described in § 71.37.

31 FR 9941

§ 71.39 Specific standards for a Fissile Class II package.

(a) A Fissile Class II package shall be so designed and constructed and its contents so limited, and the number of such packages which may be transported together so limited, that:

(1) Five times that number of such undamaged packages would be subcritical in any arrangement if closely reflected by water; and

(2) Twice that number of such packages would be subcritical in any arrangement if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered. The condition of the package shall be assumed to be as described in § 71.37.

31 FR 9941

(b) The transport index for each Fissile Class II package is calculated by dividing the number 50 by the number of such Fissile Class II packages which may be transported together as determined under the limitations of paragraph (a) of this section. The calculated number shall be rounded up to the first decimal place.

33 FR 17621

§ 71.40 Specific standards for a Fissile Class III shipment.

A package for Fissile Class III shipment shall be so designed and constructed and its contents so limited, and the number of packages in a Fissile Class III shipment shall be so limited, that:

(a) The undamaged shipment would be subcritical with an identical shipment in contact with it and with the two shipments closely reflected on all sides by water; and

(b) The shipment would be subcritical if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with the packages in the most reactive arrangement and with the most reactive degree of interspersed hydrogenous moderation which would be credible considering the controls to be exercised over the shipment. The condition of the package shall be assumed to be as described in § 71.37. Hypothetical accident conditions different from those specified in this paragraph may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

31 FR 9941

§ 71.41 Previously constructed packages for irradiated solid nuclear fuel.

Notwithstanding any other provisions of this Subpart, a package, the use of which has been authorized by the Commission for the transport of irradiated solid nuclear fuel on or after September 23, 1961, and which has been completely constructed prior to January 1, 1967, shall be deemed to comply with the package standards of this subpart for that purpose.

39 FR 20960

§ 71.42 Special requirements for plutonium shipments after June 17, 1978.

(a) Notwithstanding the exemption in § 71.9, plutonium in excess of twenty (20) curies per package shall be shipped as a solid.

(b) Plutonium in excess of twenty (20) curies per package shall be packaged in a separate inner container placed within outer packaging that meets the requirements of Subpart C for packaging of material in normal form. The separate inner container shall not release plutonium when the entire package is subjected to the normal and accident test conditions specified in Appendices A and B. Solid plutonium in the following forms is exempt from the requirements of this paragraph:

(1) Reactor fuel elements;

(2) Metal or metal alloy; or

(3) Other plutonium bearing solids that the Commission determines should be exempt from the requirements of this section.

(c) Authority in AEC licenses issued pursuant to this part for delivery of plutonium to a carrier for transport under conditions which do not meet the limitations of paragraphs (a) and (b) of this section shall expire on June 17, 1978.

Subpart D—Operating Procedures

§ 71.51 Establishment and maintenance of procedures.

The licensee shall establish and maintain:

(a) Operating procedures adequate to assure that the determinations and controls required by this chapter are accomplished;

(b) Procedures for opening and closing packages in which licensed material is transported to provide safety and to assure that, prior to delivery to a carrier for transport, each package is properly closed for transport; and

(c) Regular and periodic inspection procedures adequate to assure that the procedures required by paragraphs (a) and (b) of this section are followed.

37 FR 398

§ 71.52 Assumptions as to unknown properties.

When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties have such credible values as will cause the maximum nuclear reactivity.

§ 71.53 Preliminary determinations.

(a) Prior to the first use of any packaging for the shipment of licensed materials, the licensee shall ascertain that there are no cracks, pinholes, uncontrolled voids or other defects which could significantly reduce the effectiveness of the packaging.

(b) Prior to the first use of any packaging for the shipment of licensed materials, where the maximum normal operating pressure will exceed 5 pounds per square inch gauge, the licensee shall test the containment vessel to assure that it will not leak at an internal pressure 50 percent higher than the maximum normal operating pressure.

(c) Packaging shall be conspicuously and durably marked with its model number. Prior to applying the model number, the licensee shall determine that the packaging has been fabricated in accordance with the design approved by the Commission.

31 FR 9941

§ 71.54 Routine determinations.

Prior to each use of a package for shipment of licensed material the licensee shall ascertain that the package with its contents satisfies the applicable requirements of Subpart C of this part and of the license, including determinations that:

(a) The packaging has not been significantly damaged;

(b) Any moderators and nonfissile neutron absorbers, if required, are present and are as authorized by the Commission;

(c) The closure of the package and any sealing gaskets are present and are free from defects;

(d) Any valve through which primary coolant can flow is protected against tampering;

(e) The internal gauge pressure of the package will not exceed, during the anticipated period of transport, the maximum normal operating pressure;

(f) Contamination of the primary coolant will not exceed, during the anticipated period of transport, the limits specified in § 71.35(a)(4).

The provisions of this section shall not be applicable for packages authorized in the general licenses granted by § 71.6. In such cases the licensee shall ascertain that the contents of the package are as authorized in the general license.

37 FR 3985

§ 71.55 Opening instructions.

Prior to delivery of a package to a carrier for transport, the licensee shall assure that any special instruction needed to safely open the package are sent to or have been made available to the consignee.

31 FR 9941

§ 71.61 Reports.

The licensee shall report to the Director of Licensing,* U.S. Atomic Energy Commission, Washington, D.C. 20545, within 30 days any instance in which there is substantial reduction in the effectiveness of any authorized packaging during use.

38 FR 10437

§ 71.62 Records.

(a) The licensee shall maintain for a period of 2 years after its generation a record of each shipment of fissile material or of more than a type A quantity of radioactive material as defined in § 71.4 (q), in a single package, showing, where applicable:

(1) Identification of the packaging by model number;

(2) Details of any significant defects in the packaging, with the means employed to repair the defects and prevent their recurrence;

(3) Volume and identification of coolant;

(4) Type and quantity of licensed material in each package, and the total quantity in each shipment;

(5) For each item of irradiated fissile material:

(i) Identification by model number;

(ii) Irradiation and decay history to the extent appropriate to demonstrate that its nuclear and thermal characteristics comply with license conditions;

(iii) Any abnormal or unusual condition relevant to radiation safety.

(6) Date of the shipment;

(7) For Fissile Class III, any special controls exercised;

(8) Name and address of the transferee;

(9) Address to which the shipment was made; and

(10) Results of the determinations required by §§ 71.53 and 71.54.

(b) The licensee shall make available to the Commission for inspection, upon reasonable notice, all records required by this part.

31 FR 9941

§ 71.63 Inspection and tests.

(a) The licensee shall permit the Commission at all reasonable times to inspect the licensed material, packaging, and premises and facilities in which the licensed material or packaging are used, produced, tested, stored or shipped.

(b) The licensee shall perform, and permit the Commission to perform, such tests as the Commission deems necessary or appropriate for the administration of the regulations in this chapter.

36 FR 16894

§ 71.64 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or any regulation or order issued thereunder. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act or any rule, regulation, or order issued thereunder, or any term, condition, or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. Any person who willfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a crime, and, upon conviction, may be punished by fine or imprisonment or both, as provided by law.

*Amended by 38 FR 1271.

APPENDICES

APPENDIX A—NORMAL CONDITIONS OF TRANSPORT

Each of the following normal conditions of transport is to be applied separately to determine its effect on a package.

1. *Heat*—Direct sunlight at an ambient temperature of 130° F. in still air.

2. *Cold*—An ambient temperature of −40° F. in still air and shade.

3. *Pressure*—Atmospheric pressure of 0.5 times standard atmospheric pressure.

4. *Vibration*—Vibration normally incident to transport.

5. *Water Spray*—A water spray sufficiently heavy to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes.

6. *Free Drop*—Between 1½ and 2½ hours after the conclusion of the water spray test, a free drop through the distance specified below onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

FREE FALL DISTANCE

Package weight (pounds)	*Distance (feet)*
Less than 10,000	4
10,000 to 20,000	3
20,000 to 30,000	2
More than 30,000	1

7. *Corner Drop*—A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.

8. *Penetration*—Impact of the hemispherical end of a vertical steel cylinder 1¼ inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

9. *Compression*—For packages not exceeding 10,000 pounds in weight, a compressive load equal to either 5 times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

APPENDIX B—HYPOTHETICAL ACCIDENT CONDITIONS

The following hypothetical accident conditions are to be applied sequentially, in the order indicated, to determine their cumulative effect on a package or array of packages.

1. *Free Drop*—A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

2. *Puncture*—A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface. The bar shall be 6 inches in diameter, with the top horizontal and its edge rounded to a radius of not more than one-quarter inch, and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface.

3. *Thermal*—Exposure to a thermal test in which the heat input to the package is not less than that which would result from exposure of the whole package to a radiation environment of 1,475° F. for 30 minutes with an emissivity coefficient of 0.9, assuming the surfaces of the package have a absorption coefficient of 0.8. The package shall not be cooled artificially until 3 hours after the test period unless it can be shown that the temperature on the inside of the package has begun to fall in less than 3 hours.

4. *Water Immersion* (fissile material packages only)—Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than 8 hours.

APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES

Element*	Radionuclide***	Group
Actinium (89)	Ac 227	I
	Ac 228	I
Americium (96)	Am 241	I
	Am 243	I
Antimony (51)	Sb 122	IV
	Sb 124	III
	Sb 126	III
Argon (18)	Ar-37	VI
	Ar-41	II
	Ar-41 (uncompressed).**	V
Arsenic (33)	As 73	IV
	As 74	IV
	As 76	IV
	As 77	IV
Astatine (85)	At 211	III
Barium (56)	Ba 131	IV
	Ba-133	IV
	Ba 140	II

See footnotes at end of table.

APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES—Continued

Element*	Radionuclide***	Group
Berkelium (97)	Bk 249	I
Beryllium (4)	Be 7	IV
Bismuth (83)	Bi 206	IV
	Bi 207	III
	Bi 210	II
	Bi 212	III
Bromine (35)	Br 82	IV
Cadmium (48)	Cd 109	IV
	Cd 115 m	III
	Cd 115	IV
Calcium (20)	Ca 45	IV
	Ca 47	IV
Californium (98)	Cf 249	I
	Cf 250	I
	Cf 252	I
Carbon (6)	C 14	IV
Cerium (58)	Ce 141	IV
	Ce 143	IV
	Ce 144	III
Cesium (55)	Cs 131	IV
	Cs 134 m	III
	Cs 134	III
	Cs 135	IV
	Cs 136	IV
	Cs 137	III
Chlorine (17)	Cl 36	III
	Cl 38	IV
Chromium (24)	Cr 51	IV
Cobalt (27)	Co 56	III
	Co 57	IV
	Co 58 m	IV
	Co 58	IV
	Co 60	III
Copper (29)	Cu 64	IV
Curium (96)	Cm 242	I
	Cm 243	I
	Cm 244	I
	Cm 245	I
	Cm 246	I
Dysprosium (66)	Dy 164	III
	Dy 165	IV
	Dy 166	IV
Erbium (68)	Er 169	IV
	Er 171	IV
Europium (63)	Eu 150	III
	Eu 152 m	IV
	Eu 152	III
	Eu 154	II
	Eu 155	IV
Fluorine (9)	F 18	IV
Gadolinium (64)	Gd 153	IV
	Gd 159	IV
Gallium (31)	Ga 67	III
	Ga 72	IV
Germanium (32)	Ge 71	IV
Gold (79)	Au 193	III
	Au 194	III
	Au 195	III
	Au 196	IV
	Au 198	IV
	Au 199	IV
Hafnium (72)	Hf 181	IV
Holmium (67)	Ho 166	IV
Hydrogen (1)	H 3 (see tritium)	
Indium (49)	In 113 m	IV
	In 114 m	III
	In 115 m	IV
	In 115	IV
Iodine (53)	I 124	III
	I 125	III
	I 126	III
	I 129	III
	I 131	III
	I 132	IV
	I 133	III
	I 134	IV
	I 135	IV
Iridium (77)	Ir 190	IV
	Ir 192	III
	Ir 194	IV
Iron (26)	Fe 55	IV
	Fe 59	IV
Krypton (36)	Kr 85 m	III
	Kr 85 m (uncompressed).**	V
	Kr 85	III
	Kr 85 (uncompressed).**	VI
	Kr 87	II
	Kr 87 (uncompressed).**	V
Lanthanum (57)	La 140	IV
Lead (82)	Pb 203	IV
	Pb 210	II
	Pb 212	II
Lutecium (71)	Lu 172	III
	Lu 177	IV
Magnesium (12)	Mg 28	III
Manganese (25)	Mn 52	IV
	Mn 54	IV
	Mn 56	IV
Mercury (80)	Hg 197 m	IV
	Hg 197	IV
	Hg 203	IV
Mixed fission products MFP.		II

See footnotes at end of table.

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APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES—Continued

Element*	Radionuclide***	Group
Molybdenum (42)	Mo 99	IV
Neodymium (60)	Nd 147	IV
	Nd 149	IV
Neptunium (93)	Np 237	I
	Np 239	I
Nickel (28)	Ni 56	III
	Ni 59	IV
	Ni 63	IV
	Ni 65	IV
Niobium (41)	Nb 93 m	IV
	Nb 95	IV
	Nb 97	IV
Osmium (76)	Os 185	IV
	Os 191 m	IV
	Os 191	IV
	Os 193	IV
Palladium (46)	Pd 103	IV
	Pd 109	IV
Phosphorus (15)	P 32	IV
Platinum (78)	Pt 191	IV
	Pt 193	IV
	Pt 193 m	IV
	Pt 197 m	IV
	Pt 197	IV
Plutonium (94)	Pu 238 (F)	I
	Pu 239 (F)	I
	Pu 240	I
	Pu 241 (F)	I
	Pu 242	I
Polonium (84)	Po 210	I
Potassium (19)	K 42	IV
	K 43	III
Praseodymium (59)	Pr 142	IV
	Pr 143	IV
Promethium (61)	Pm 147	IV
	Pm 149	IV
Protactinium (91)	Pa 230	I
	Pa 231	I
	Pa 233	II
Radium (88)	Ra 223	II
	Ra 224	II
	Ra 226	I
	Ra 228	I
Radon (86)	Rn 220	IV
	Rn 222	II
Rhenium (75)	Re 183	IV
	Re 186	IV
	Re 187	IV
	Re 188	IV
	Re Natural	IV
Rhodium (45)	Rh 103 m	IV
	Rh 106	IV
Rubidium (37)	Rb 86	IV
	Rb 87	IV
	Rb Natural	IV
Ruthenium (44)	Ru 97	IV
	Ru 103	IV
	Ru 105	IV
	Ru 106	III
Samarium (62)	Sm 145	III
	Sm 147	III
	Sm 151	IV
	Sm 153	IV
Scandium (21)	Sc 46	III
	Sc 47	IV
	Sc 48	IV
Selenium (34)	Se 75	IV
Silicon (14)	Si 31	IV
Silver (47)	Ag 105	IV
	Ag 110 m	II
	Ag 111	IV
Sodium (11)	Na 22	III
	Na 24	IV
Strontium (38)	Sr 85 m	IV
	Sr 85	IV
	Sr 89	III
	Sr 90	II
	Sr 91	III
	Sr 92	IV
Sulphur (16)	S 35	IV
Tantalum (73)	Ta 182	III
Technetium (43)	Tc 96 m	IV
	Tc 96	IV
	Tc 97 m	IV
	Tc 97	IV
	Tc 99 m	IV
	Tc 99	IV
Tellurium (52)	Te 125 m	IV
	Te 127 m	IV
	Te 127	IV
	Te 129 m	III
	Te 129	IV
	Te 131 m	III
	Te 132	IV
Terbium (65)	Tb 160	III
Thallium (81)	Tl 200	IV
	Tl 201	IV
	Tl 202	IV
	Tl 204	III
Thorium (90)	Th 227	II
	Th 228	I
	Th 230	I
	Th 231	I
	Th 232	III
	Th 234	II
	Th Natural	III

APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES—Continued

Element*	Radionuclide***	Group
Thulium (69)	Tm 168	III
	Tm 170	III
	Tm 171	IV
Tin (50)	Sn 113	IV
	Sn 117 m	III
	Sn 121	III
	Sn 126	IV
Tritium (1)	H 3	IV
	H 3 (as a gas, as luminous paint, or adsorbed on solid material)	VII
Tungsten (74)	W 181	IV
	W 185	IV
	W 187	IV
Uranium (92)	U 230	II
	U 232	I
	U 233 (F)	II
	U 234	II
	U 235 (F)	III
	U 236	II
	U 238	III
	U Natural	III
	U Enriched (F)	III
	U Depleted	III
Vanadium (23)	V 48	IV
	V 49	III
Xenon (54)	Xe 125	III
	Xe 131 m	III
	Xe 131 m (uncompressed).**	V
	Xe 133	III
	Xe 133 (uncompressed).**	VI
	Xe 135	II
	Xe 135 (uncompressed).**	V
Ytterbium (70)	Yb 175	IV
Yttrium (39)	Y 88	III
	Y 90	IV
	Y 91 m	III
	Y 91	III
	Y 92	IV
	Y 93	IV
Zinc (30)	Zn 65	IV
	Zn 69 m	IV
	Zn 69	IV
Zirconium (40)	Zr 93	IV
	Zr 95	III
	Zr 97	IV

*Atomic number shown in parentheses.
** Uncompressed means at a pressure not exceeding one atmosphere.
*** Atomic weight shown after the radionuclide symbol.
m—Metastable state.
(F) Fissile material.

APPENDIX D—TESTS FOR SPECIAL FORM LICENSED MATERIAL

1. *Free Drop*—A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.

2. *Percussion*—Impact of the flat circular end of a 1 inch diameter steel rod weighing 3 pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than 1 inch thick, supported by a smooth essentially unyielding surface.

3. *Heating*—Heating in air to a temperature of 1,475° F. and remaining at that temperature for a period of 10 minutes.

4. *Immersion*—Immersion for 24 hours in water at room temperature. The water shall be at pH 6–pH 8, with a maximum conductivity of 10 micromhos per centimeter.

The record keeping and reporting requirements contained in this part have been approved by the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

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[10 CFR Part 71]

PACKAGING OF RADIOACTIVE MATERIAL FOR TRANSPORT AND TRANSPORTATION OF RADIOACTIVE MATERIAL

Quality Assurance Requirements for Shipping Containers

The Atomic Energy Commission has under consideration amendments to its regulations in 10 CFR Part 71 "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions," to upgrade requirements for quality assur-

ance in the design, fabrication, assembly, testing, use and maintenance of packagings for shipping and transporting licensed radioactive material. The amendments would also revoke, subject to a timely application for reapproval, the present authority to use certain shipping casks for solid irradiated nuclear fuel which had been approved under criteria used before the current standards were developed.

Under the proposed amendments which follow, each licensee subject to 10 CFR Part 71 would be required to assess the adequacy of his quality assurance program against the upgraded standards and requirements, and to make whatever changes are required to comply with those standards and requirements. AEC would verify compliance with the standards through its licensing and inspection programs. Each applicant for a license or license amendment under 10 CFR Part 71 would be required to describe his quality assurance program to be applied to the design, fabrication, assembly, testing, maintenance and use of his proposed packaging. The applicant would further be required to identify the codes, standards and general requirements to be imposed under the program. Within this framework, the licensee would be required to document his quality assurance program in detailed written procedures and requirements, and follow those procedures and requirements in his operations. The adequacy of the detailed written documents and the licensee's implementation of them would be determined through the Commission's compliance program. That adequacy will be judged in part on the complexity and proposed use of the package under consideration, and on the complexity and importance to safety of its components.

The quality assurance requirements proposed here would apply to a licensee's design, fabrication, assembly, testing, use and maintenance of a Type B, Large Quantity or Fissile material package which he constructs for himself or has someone else construct for him. In the case of a licensee using a package approved for another licensee's use, in accordance with the general license provisions of present § 71.12, the quality assurance requirements of the licensee for whom the package was first approved must be followed in the use, testing and maintenance of the package by the second licensee. Any changes in the program must be approved by the Commission.

A new provision would require notification of the Commission's Directorate of Regulatory Operations before fabrication is begun of packaging with certain heat loads or anticipated internal pressures. This would facilitate communication between the licensee and the Commission's regulatory staff to resolve any differences on the adequacy of the quality assurance program before significant expenditures and irretrievable effort are committed to packaging of such importance.

To assure that external contamination of packages is kept as low as practicable, a new provision would require that external surfaces of packaging be designed and finished to facilitate decontamination.

Authority to use certain shipping casks for solid irradiated nuclear fuel is contained in § 71.41 of Part 71 "Previously constructed packages for irradiated solid nuclear fuel." This authority applies to shipping casks approved after September 23, 1961 and constructed by January 1, 1967, when the current package standards system was first adopted in the United States. Under these proposed amendments, any such casks still in use must be shown to comply with current package standards, either in their present condition or after modification.

Pursuant to the Atomic Energy Act of 1954, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments to 10 CFR Part 71 is contemplated. All interested persons who desire to submit written comments or suggestions for consideration in connection with the proposed amendments should send them to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff, by February 11, 1974. Copies of comments on the proposed amendments may be examined at the Commission's Public Document Room at 1717 H Street NW., Washington, D.C.

1. Paragraph (c) of § 71.21 is amended to read as follows:

§ 71.21 Contents of application.

* * * * *

(c) A description of the proposed program of quality assurance as required by § 71.24.

2. Section 71.24 is amended to read as follows:

§ 71.24 Quality assurance.

(a) The applicant shall describe his quality assurance program to be applied to the design, fabrication, assembly, testing, maintenance and use of the proposed packaging. Appendix E, "Quality Assurance Criteria For Shipping Containers For Radioactive Material" sets forth the requirements for quality assurance programs for packaging. The description of the program shall include a discussion of how the applicable requirements of Appendix E will be satisfied.

(b) The applicant shall identify, by title and qualifications, the individual(s) in his organization responsible for assuring that packages of radioactive materials to be delivered to a carrier for transport have been prepared in accordance with all applicable requirements.

(c) The applicant shall identify the codes and standards proposed for package design, fabrication, assembly, testing, maintenance and use.

3. A new paragraph (e) is added to § 71.31 to read as follows:

§ 71.31 General standards for all packaging.

* * * * *

(e) The external surfaces of packaging shall, as far as practicable, be designed, fabricated and finished to facilitate decontamination.

4. Section 71.41 is amended to read as follows:

§ 71.41 Previously constructed packages for irradiated solid nuclear fuel.

(a) Notwithstanding any other provisions of this subpart, a package, the use of which has been authorized by the Commission for the transport of irradiated solid nuclear fuel on or after September 23, 1961, and which has been completely constructed prior to January 1, 1967, shall be deemed to comply with the package standards of this subpart for that purpose, except as otherwise provided in paragraph (b).

(b) The holder of the specific license providing the authority specified in paragraph (a) of this section shall, within 6 months after (the effective date of this section), file a consolidated application for a superseding license for the use of such packages in accordance with this part. If the licensee fails to do so, the provisions of paragraph (a) of this section and the authority granted by the license to deliver the material to a carrier for transport in such packages shall expire at that time. The Commission may issue a new license superseding the existing license, may confirm the existing license with or without modification, or may deny the application in whole or in part and terminate the existing license in whole or in part. If modification of the design of a package being used under the authority of this section in effect prior to (effective date of these amendments) is proposed by a licensee in his application for a superseding license in accordance with this paragraph, the licensee shall designate in his application the time period needed to modify the package(s) after approval by the Commission.

5. Section 71.51 is amended to read as follows:

§ 71.51 Establishment and maintenance of a quality assurance program.

The licensee shall establish, maintain and execute a quality assurance program satisfying each of the criteria specified in Appendix E "Quality Assurance Criteria for Shipping Containers For Radioactive Material."

6. Section 71.53 is amended to read as follows:

§ 71.53 Initial determinations and tests.

Tests shall be performed or determinations made, prior to the first use of a package, to satisfy the requirements of this section and of the license. After determining that the packaging has been fabricated in accordance with the design approved by the Commission, the packaging shall be conspicuously and durably marked with its model number, as specified in the license, and with a unique manufacturer's serial number.

(a) If a completely sealed shielding chamber is necessary to demonstrate compliance with the requirements of this part, its leak-tightness shall be demonstrated by test, appropriate for the

shielding material to be contained, during the fabrication of the packaging and before the shielding chamber is filled with shielding material. This test shall be performed while possible leakage points are accessible for repair and before any leak paths can be plugged with shielding material. If leakage is indicated, the leaks shall be located and repaired, and the test repeated. The leak test of the shielding chamber may be performed after the addition of the shielding material whenever such procedure provides higher assurance of shielding chamber leak-tightness than the test otherwise specified in this paragraph.

(b) If a completely sealed chamber is necessary to demonstrate compliance with the requirements of this part, its leaktightness and structural integrity shall be demonstrated by test, appropriate for the material to be contained. The chamber shall be pressurized to 1.5 times the sum of the maximum normal operating pressure and any differential pressure below mean sea-level atmospheric pressure to which it may be subjected in transit, or to 11 psig, whichever is greater, and the pressure maintained for at least 10 minutes. If the chamber will contain radioactive material, the leak test shall have a minimum sensitivity of $A \times 10^{-4}$ per hour, where A is the Type A quantity for the material to be contained. If the chamber will not contain radioactive material, the leak test shall be sufficiently sensitive to detect any leakage beyond that determined to be acceptable under § 71.35. If any leakage above those rates, or any mechanical deformation beyond that determined to be acceptable under § 71.35 is shown, corrective action shall be taken and retesting performed.

(c) If the decay heat load from the approved contents of a package is greater than 5 watts, the adequacy of the package design to safely dissipate the design heat load shall be demonstrated by test. If the decay heat load is greater than 5 kilowatts, each package shall be demonstrated by test to safely dissipate the design heat loads. The heat source used in the test shall be the design heat load and shall be placed in the normal position for heat generation.

(d) If packaging incorporates shielding to meet dose rate limits, the effectiveness of the shielding shall be demonstrated by test. The packaging shall be loaded with the type of material for which it is designed, or an equivalent source of radiation, and the entire outer surface shall be surveyed for radiation in excess of the predicted levels.

(e) If packaging incorporates one or more valves to meet the release limits of § 71.36, the functioning of each individual valve to be used shall be demonstrated by test to function according to its design. The test shall be conducted with the valve(s) at the temperature and pressure anticipated if the package were subjected to the hypothetical accident conditions specified in Appendix B. In conducting the test, it is not necessary that the entire package be subjected to the test conditions. This test shall be repeated at intervals not to exceed one year.

(f) If packaging incorporates one or more seals in its closure system to meet the release limits of § 71.36, the functioning of each individual seal to be used shall be demonstrated by test to function according to its design. The test shall be conducted at the pressure anticipated if the package were subjected to the hypothetical accident conditions specified in Appendix B. Unless the seal is to be replaced after each use, the test shall include cycling (opening and closing) of the seal closure for a number of times appropriate for the intended use of the seal. This test shall be repeated at intervals not exceeding one year.

(g) If packaging incorporates neutron moderators or non-fissile neutron absorbers, the design efficacy of these materials shall be demonstrated by test or examination.

7. New paragraphs (g), (h) and (i) are added to § 71.54 to read as follows:

§ 71.54 Routine determinations.

Prior to each use of a package for shipment of licensed material the licensee shall ascertain that the package with its contents satisfies the applicable requirements of Subpart C and of the license, including determinations that:

* * * * *

(g) Space provided for contained expansion of liquid coolant or a liquid shielding medium is adequate, auxiliary devices important to the containment of liquid coolant or a liquid shielding medium are functioning properly, and the systems for the liquid coolant and the liquid shielding medium are leaktight.

(h) The pressure relief valve or valves are operable.

(i) The package has been closed and sealed in accordance with written procedures.

8. In § 71.62 a new paragraph (c) is added and paragraph (a)(10) is amended to read as follows:

§ 71.62 Records.

(a) The licensee shall maintain for a period of 2 years after its generation a record of each shipment of fissile material or of more than a type A quantity of radioactive material, as defined in § 71.4(q), in a single package, showing, where applicable:

* * * * *

(10) Results of the determinations required by § 71.54.

* * * * *

(c) The licensee shall maintain, during the life of the packaging to which they pertain, sufficient quality assurance records to furnish documentary evidence of the quality of items which have safety significance, and of services affecting such quality, including records of the results of the determinations required by § 71.53, and of monitoring, inspection and auditing of work performance during the design, fabrication and assembly of the packaging.

9. A new paragraph (c) is added to § 71.63 to read as follows:

§ 71.63 Inspections and tests.

* * * * *

(c) The licensee shall notify the Director of Regulatory Operations, U.S. Atomic Energy Commission, Washington, D.C. 20545, at least 45 days prior to fabrication of a package to be used for the shipment, in that single package, of radioactive material having a decay heat load in excess of 5 kW or with an operating pressure in excess of 15 psig.

10. A new Appendix E is added to read as follows:

APPENDIX E—QUALITY ASSURANCE CRITERIA FOR SHIPPING CONTAINERS FOR RADIOACTIVE MATERIAL

Introduction: In accordance with § 71.34, every applicant for a license or license amendment for use of a shipping container (packaging) is required to describe his quality assurance program, and every licensee is required by § 71.51 to establish and maintain a quality assurance program for the design, fabrication, assembly, testing, use and maintenance of each packaging. Packaging is defined in § 71.4(l), and includes all receptacles, wrappers, components, and supplementary equipment in and with which radioactive material is transported.

This appendix establishes quality assurance requirements which apply to all activities affecting the components of the packaging which are significant to safety. These activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, assembling, inspecting, testing, operating, maintaining, repairing, and modifying.

As used in this appendix, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements.

1. ORGANIZATION

The licensee shall be responsible for the establishment and execution of the quality assurance program. The licensee may delegate to other organizations the work of establishing and executing the quality assurance program, or any part thereof, but shall retain responsibility therefor. The authority and duties of persons and organizations performing quality assurance functions shall be clearly established and delineated in writing. Such persons and organizations shall have sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions. In general, assurance of quality requires management measures which provide that the individual or group assigned the responsibility for checking, auditing, inspecting, or otherwise verifying that an activity has been correctly performed be independent of the individual or group directly responsible for performing the specific activity.

2. QUALITY ASSURANCE PROGRAM

The licensee shall establish at the earliest practicable time, consistent with the schedule for accomplishing the activities, a quality assurance program which complies with the requirements of this appendix. The quality assurance program shall be documented by written procedures or instructions, and shall be carried out in accordance with those pro-

cedures throughout the period during which packaging is used. The licensee shall identify the material and components to be covered by the quality assurance program and the major organizations participating in the program, together with the designated function of these organizations. The quality assurance program shall provide control over activities affecting the quality of the identified materials and components to an extent consistent with their importance to safety, and as necessary to assure conformance to the approved design of each individual package used for the shipment of radioactive material. Activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanness; and assurance that all prerequisites for the given activity have been satisfied. The program shall take into account the need for special controls, processes, test equipment, tools and skills to attain the required quality, and the need for verification of quality by inspection and test.

The licensee shall base the requirements and procedures of his quality assurance program on the following considerations concerning the complexity and proposed use of the package and its components:

(1) The importance of malfunction or failure of the item to safety;

(2) The design and fabrication complexity or uniqueness of the item;

(3) The need for special controls and surveillance over processes and equipment;

(4) The degree to which functional compliance can be demonstrated by inspection or test; and

(5) The quality history and degree of standardization of the item. The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained. The licensee shall review the status and adequacy of the quality assurance program at established intervals. Management of other organizations participating in the quality assurance program shall regularly review the status and adequacy of that part of the quality assurance program which they are executing.

3. DESIGN CONTROL

Measures shall be established to assure that applicable regulatory requirements and the package design, as specified in the license, for those materials and components to which this appendix applies, are correctly translated into specifications, drawings, procedures and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled. Measures shall be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the materials and components.

Measures shall be established for the identification and control of design interfaces and for coordination among participating design organizations. These measures shall include the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces. The design control measures shall provide for verifying or checking the adequacy of any new design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. The verifying or checking process shall be performed by individuals or groups other than those who performed the original design, but who may be from the same organization. Where a test program is used to verify the adequacy of a specific design feature in lieu of other verifying or checking processes, it shall include suitable qualification testing of a prototype unit under the most adverse design conditions. Design control measures shall be applied to items such as the following: criticality physics, stress, thermal, hydraulic, and accident analyses; compatibility of materials; accessibility for inservice inspection, maintenance and repair; and delineation of acceptance criteria for inspections and tests.

Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design. Changes in the conditions specified in the license require Commission approval.

4. PROCUREMENT DOCUMENT CONTROL

Measures shall be established to assure that applicable requirements of this part which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the licensee or by his contractors or subcontractors. To the extent necessary, the licensee shall require contractors or subcontractors to provide a quality assurance program consistent with the pertinent provisions of this part.

5. INSTRUCTIONS, PROCEDURES AND DRAWINGS

Activities affecting quality in the fabrication, use and maintenance of packaging shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. These shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Procedures shall be established for opening, loading, closing and preparing packages for transport to assure that, prior to delivery to a carrier for transport, all applicable conditions of approval, such as limits on the fissile content, weight and heat generation rate, are met and that each package is properly closed.

6. DOCUMENT CONTROL

Measures shall be established to control the issuance of documents, such as instructions, procedures, and drawings, including changes thereto, which prescribe all activities affecting quality. These measures shall assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and are distributed and used at the location where the prescribed activity is performed. Changes to documents shall be reviewed and approved by the same organizations that performed the original review and approval unless the applicant designates another organization. Changes in the conditions specified in the license require Commission approval.

7. CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery. Documentary evidence that material and equipment conform to the procurement specifications shall be available prior to installation or use of such material and equipment. This documentary evidence shall be retained by or be available to the licensee and shall be sufficient to identify the specific requirements met by the purchased material and equipment. The effectiveness of the measures for control of purchased material, equipment and services shall be assessed by the licensee or his designee at appropriate intervals.

8. IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

Measures shall be established for the identification and control of materials, parts, and components. These measures shall assure that identification of the item is maintained by heat number, part number, or other appropriate means, either on the item or on records traceable to the item, as required throughout fabrication, installation, and use of the item. These identification and control measures shall be designed to prevent the use of incorrect or defective materials, parts and components.

9. CONTROL OF SPECIAL PROCESSES

Measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

10. INSPECTION

A program for inspection of activities affecting quality shall be established and executed by or for the organization performing the activity to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity. Such inspection shall be performed by individuals other than those who performed the activity being inspected. Examination, measurements, or tests of material or products processed shall be performed for each work operation where necessary to assure quality. If inspection of processed material or products is impossible or disadvantageous, indirect control by monitoring processing methods, equipment, and personnel shall be provided. Both inspection and process monitoring shall be provided when quality control is inadequate without both. If mandatory inspection hold points, which require witnessing or inspecting by the licensee's designated representative and beyond which work shall not proceed without the consent of its designated representative, are required, the specific hold points shall be indicated in appropriate documents.

11. TEST CONTROL

A test program shall be established to assure that all testing required to demonstrate that the packaging components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements of this part and the requirements and acceptance limits contained in the package approval. The procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions. Test results shall be documented and evaluated to assure that test requirements have been satisfied.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

Measures shall be established to assure that tools, gages, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, cali-

brated, and adjusted to maintain accuracy within necessary limits.

13. HANDLING, STORAGE AND SHIPPING

Measures shall be established to control the handling, storage, shipping, cleaning and preservation of materials and equipment to be used in packaging in accordance with instructions to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, specific moisture content levels and temperature levels shall be specified and provided.

14. INSPECTION, TEST AND OPERATING STATUS

Measures shall be established to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the status of inspections and tests performed upon individual items of the packaging.

These measures shall provide for the identification of items which have satisfactorily passed required inspections and tests, where necessary to preclude inadvertent by-passing of such inspections and tests. Measures shall also be established for indicating the operating status of components of the packaging, such as by tagging valves and switches, to prevent inadvertent operation.

15. NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

Measures shall be established to control materials, parts, or components which do not conform to requirements in order to prevent their inadvertent use or installation. These measures shall include, as appropriate, procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items shall be reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures.

16. CORRECTIVE ACTION

Measures shall be established to assure that conditions adverse to quality, such as deficiencies, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of a significant condition adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

17. QUALITY ASSURANCE RECORDS

Sufficient written records shall be maintained to furnish evidence of activities affecting quality. The records shall include the following: design records, records of use and the results of reviews, inspections, tests, audits, monitoring of work performance, and materials analyses. The records shall also include closely-related data such as qualifications of personnel, procedures, and equipment. Inspection and test records shall, as a minimum, identify the inspector or data recorder, the type of observation, the results, the acceptability, and the action taken in connection with any deficiencies noted. Records shall be identifiable and retrievable. Consistent with applicable regulatory requirements, the licensee shall establish requirements concerning record retention, such as duration, location, and assigned responsibility.

18. AUDITS

A comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The audits shall be performed in accordance with the written procedures or check lists by appropriately trained personnel not having direct responsibilities in the areas being audited. Audit results shall be documented and reviewed by management having responsibility in the area audited. Followup action, including re-audit of deficient areas, shall be taken where indicated.

(Secs. 53, 62, 81, 161; Pub. L. 83-703; 68 Stat. 930, 932, 935, 948, as amended (42 U.S.C. 2073, 2092, 2111, 2201).)

Dated at Washington, D.C. this 19th day of December 1973.

For the Atomic Energy Commission.

GORDON M. GRANT,
Acting Secretary
of the Commission.

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Nussbaumer Exhibit D

Development Report

SC-DR-72 0597
September 1972

SPECIAL TESTS FOR PLUTONIUM SHIPPING CONTAINERS 6M, SP5795, AND L-10

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SPECIAL TESTS FOR PLUTONIUM SHIPPING CONTAINERS 6M, SP5795, AND L-10

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Printed September 1972

ABSTRACT

This report summarizes the results of three extra-severe environmtnts imposed on three plutonium shipping containers.

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SPECIAL TESTS FOR PLUTONIUM SHIPPING CONTAINERS 6M, SP5795, AND L-10

Introduction

On December 30, 1971, AEC/ALO requested Sandia Laboratories, Albuquerque (SLA), to prepare a proposal for a test and evaluation program which would subject three plutonium shipping containers to three extra-severe destructive tests to determine their margin of safety in excess of the accident damage test standards specified in DOT regulation (49 CFR 173.398). The containers to be evaluated were the L-10 (110 gallon), SP5795 (55 gallon), and 6M (10 gallon). The tests to be imposed on the containers were a puncture test at 25 feet-per-second (fps) onto a 6-inch diameter steel post, a 130-fps impact test in the predicted most severe orientation, and a fire test at 1800°F for 1 hour.

On February 7, 1972, SLA submitted a proposal to AEC/ALO for these tests. SLA was notified April 5, 1972, that the proposal was acceptable and that SLA should proceed with the tests. AEC/ALO then notified SLA that only the 6M containers would be supplied by AEC and that SLA should order the SP5795 and L-10 containers. The test program was conducted during the months of May and June 1972. This report describes these tests and presents the effects of the severe environments on the containers.

Test Objectives

The object of these tests was to determine the margin of safety (extra integrity) of a DOT-6M (10 gallon), a DOT-SP5795 (55 gallon), and a L-10 Class II (110 gallon) plutonium shipping container when subjected to the following environments:

1. Puncture test by dropping the container onto a 6-inch diameter steel post in a side-on attitude at an impact velocity of 25 fps.
2. Impact test by dropping the container onto a flat concrete surface in a lid-down attitude so that the container center of gravity (CG) is over the impact point at a velocity of 130 fps.
3. Fire test by suspending the container over a liquid hydrocarbon fuel fire at a temperature of 1800°F for 1 hour.

Description

6M Container

The 6M type container (Figures 1 and 2) is fabricated from a standard 10-gallon, DOT specification ICC-6C, open head, steel drum. The body is made of 20-gauge steel. The locking lip at the top is of full curl design. The lid is made of 19-gauge steel, and the locking ring is of 12-gauge steel. The bolt fittings on the locking ring are welded forged steel sized for a 5/16-inch diameter bolt. Two-inch-thick disks of Celotex industrial fiberboard are utilized inside the drum to provide thermal insulation, shock protection, and a means for centering the inner pressure vessel. The inner pressure vessel is made from a piece of 4-3/4-inch outside diameter, 1/4-inch wall steel tubing closed off at the bottom end and threaded at the top to accept a 4-inch pipe plug. Inside dimensions of the pressure vessel are 4.180-inch diameter and 10-inch length. The 6M is a DOT approved container which needs no special permit for use in shipping radioactive materials. For these tests, a one-liter polyethylene bottle, containing a dye solution, was packaged with steel wool inside the pressure vessel. Each of these containers weighed 55±2 pounds.

SP5795 Container

The SP5795 type container (Figures 1 and 3) is a standard 55-gallon, ICC Specification 17H, open head, steel drum. The body is made of 18-gauge steel. The locking lip at the top is of full curl design. The lid is made of 16-gauge steel, and the locking ring is of 12-gauge steel. The bolt fittings on the locking ring are of welded forged steel sized for a 5/8-inch diameter bolt. The inner pressure vessel is fabricated from a 5-inch schedule 80 stainless steel pipe closed off at the bottom end and flanged at the top. A flanged cover and a silicone rubber gasket are provided for sealing the pressure vessel. The pressure vessel is supported inside the outer drum by foamed glass which provides thermal insulation as well as shock mitigation. The DOT special permit (#SP5795) for this container is presented in Appendix A. A three-liter, high-density polyethylene bottle containing a dye solution was installed inside the pressure vessel for these tests. Each of these containers weighed 213±3 pounds.

L-10 Class II Container

The L-10 container (Figures 1, 4, and 5) consists of two 55-gallon, ICC Specification 17H, steel drums welded end to end. The body is made of 18-gauge steel. The locking lip at the top is of the full curl design. The lid is made of 16-gauge steel, and the locking ring is of 12-gauge steel. The bolt fittings on the locking ring are of welded forged steel sized for a 5/8-inch diameter bolt. The inner container is a stainless steel pressure vessel supported inside the drum by a tubular steel frame. The space between the drum and pressure vessel is filled with vermiculite for thermal insulation. The DOT special permit (#3P5061) for this container is presented in Appendix B. A ten-liter, high-density polyethylene bottle was filled with a dye solution, sealed in a polyvinylchloride bag, and inserted into the pressure vessel. A 1/8-inch thick neoprene pad was used as a cushion between the bottom of the bottle and the pressure vessel. Each of these containers weighed 462±5 pounds.

Conclusions

Puncture Tests

The 6M and SP5795 containers satisfactorily passed the 25-fps puncture tests; i.e., no leakage of solution from the pressure vessel was evident. In addition, there was no penetration of the outer drums.

The L-10 container satisfactorily passed the test; i.e., no leakage of solution from the pressure vessel was evident. However, because the outer drum was penetrated and loose vermiculite was lost from the inside, the pressure vessel was exposed.

It is estimated that these three containers could withstand the puncture test at a velocity of 35 fps before the pressure vessel would be damaged to cause leaking.

Impact Tests

All containers passed the impact tests; minor damage to the pressure vessels in the SP5795 and L-10 containers was sustained, and no damage to the pressure vessel in the 6M container was evident. It appears that any increase in impact velocity for the SP5795 and L-10 containers would seriously damage the vent valves in the top of the pressure vessels and might permit loss of contained liquid. The 6M container possibly could withstand an impact velocity of about 150 fps before the pressure vessel would be damaged to cause leaking.

Fire Tests

The 6M container failed to retain the solution which leaked from the bottle inside the pressure vessel. The SP5795 and L-10 containers satisfactorily passed the test; i.e., no leakage of solution from the pressure vessels was evident.

The 6M and SP5795 containers both ruptured at the lid joint and exposed the insulation to the fire. If these containers had been vented as the L-10, rupture probably would not have occurred. The polyethylene bottles inside the SP5795 and L-10 containers did not melt. The polyethylene bottle inside the 6M container melted and released the solution into the pressure vessel. The 6M container is not presently certified for shipment of radioactive solutions; however, these test results may prove useful in evaluating future applications of the 6M container. Had there been a metal or oxide contained within the pressure vessel, it appears there would have been no leakage from the pressure vessel. The fact that there was no sign of melting on the bottle indicated that the SP5795 could have withstood the fire for a longer period of time. The L-10 showed signs of melting on the bottle, indicating temperatures in the pressure vessel were locally above 275°F.

Multiple Environments

In a theoretical multiple environment of puncture and then fire, the L-10 container would have exposed the pressure vessel immediately to the direct fire and temperatures to 1800°F.

In a theoretical multiple environment of impact and then fire, all three containers would have exposed the pressure vessels directly to the fire, because the lids were popped off on one side of each container after impact.

Procedures

For each test, the plutonium shipping containers were assembled as illustrated in Figures 1 through 5. The test proposal called for a leak test of the pressure vessels conducted with halogen gas and halogen leak detection equipment. The pressure vessels were checked with Freon gas, and it was determined to be impossible to obtain a gas seal of the integrity that would permit a quantitative study of leakage. A different method of leak testing was substituted; the polyethylene bottles were filled with a Dy-Kem, steel blue, layout dye, alcohol solution, which provided a visual means for detecting any leakage through the seal.

After the bottle seal had been verified, the bottle was placed inside the pressure vessel. The pressure vessel was sealed and assembled with insulating material into the outer drum. After assembly, the container was taken to the appropriate test facility.

In preparation for the puncture test, each container, with longitudinal axis horizontal, was suspended from a wooden cradle bolted to the vertical guide wire carriage (Figure 6) of the 300-foot tower. The container was suspended with a length of 1/8-inch diameter aircraft cable. Two Holex cable cutters, Model 6803, were installed on the aircraft cable and positioned one on each side of the container. The container was hoisted to 12.5 feet above the 6-inch diameter steel post. On command, the carriage was released. Approximately 4 feet above the steel post, the container was released from the carriage by initiation of the cable cutters. The container alone continued to fall the remaining 4 feet (in the same attitude) and impacted on the steel post. A glass rod/breakwire system was used to monitor the impact velocity of each container.

The preparation for the container lid-down impact test was the same as for the puncture test except the wooden cradle on the vertical guide wire carriage was adjusted to fit the various containers and to provide the proper attitude (Figure 11). To reach 130-fps impact velocity, the container was hoisted to a height of 270 feet above the impact point. Release of the container from the carriage was by the same method used for the puncture test.

The fire pit facility in Coyote Canyon was selected for the 1800°F, 1-hour fire test. A pit 15-feet square and 2-feet deep was dug and lined with polyethylene film. Refractory brick stands were built to support the test units. One of each of the containers was secured on the refractory test stands. A 5-foot clearance was maintained between the test units and the outer edges of the pit. Distances between the three containers were from 12 to 18 inches (Figures 22 and 37).

Water (to a depth of 2 inches) was placed in the pit; 2580 gallons of JP-4 aircraft fuel (to a depth of 13 inches) were added on top of the water. Each container was located on the test stand with the container horizontal centerline at an initial distance of 15 inches above the fuel. Ignition was accomplished with a firing set, black powder, and electric matches. Duration of the fire was 55 minutes; the wind velocity was from 0 to 2 miles per hour. The final container horizontal centerline distance above the fuel was 28 inches.

In order to keep the test costs low, no thermocouple instrumentation was provided in the fire environment. Sandia Laboratories has had considerable experience with liquid hydrocarbon fuel fires; temperature data for similar fires may be found in Sandia Report No. SC-R-64-1366A.

Figure 33 shows the thermocouple array used in the tests referenced in this report; the array covers a 5-foot-diameter circle within an 18-foot-square fire pit. Figures 34 through 36 give the temperatures recorded for the various thermocouples at several heights above the fuel level in the tests reported in SC-R-64-1366A.

Results

Puncture Tests

In the puncture test, the 6M shipping container sustained minor damage to the outer steel drum as illustrated in Figure 7. The drum was dented but no puncture occurred; the Celotex insulation was crushed at the point of impact. The inner pressure vessel and the polyethylene bottle sustained no apparent damage. The measured impact velocity was 25.3 fps.

The SP5795 shipping container subjected to the puncture test sustained only minor damage to the outer steel drum as illustrated in Figure 8. The drum was dented slightly, but no puncture occurred. The foamglas insulation was crushed locally under the impact point. The measured impact velocity was 26.8 fps. The inner pressure vessel and the polyethylene bottle sustained no apparent damage. There was no leakage of solution from the bottle.

The L-10 shipping container subjected to the puncture test sustained puncture damage to the outer steel drum as illustrated in Figures 9 and 10. The drum was dented and punctured by the steel post. The parent metal was torn at the weld joint between the two 55-gallon drums. The loose vermiculite insulation, which was lost from inside the container, exposed the inner pressure vessel. The tubular steel frame, pressure vessel, and polyethylene bottle were not damaged in the test. The measured impact velocity was 28.2 fps.

Impact Tests

A 6M shipping container was subjected to lid-down impact onto a flat concrete surface at a measured impact velocity of 125 fps. The Holex cable cutters which should have released the container from the carriage about 4 feet above the impact point did not initiate because of a lead wire which tangled and broke shortly after carriage release. The momentum of the container, however, broke the 1/8-inch aircraft cable used to attach the container to the carriage, and the container impacted the concrete surface near the requested attitude angle. The lip popped off one side, and the container crushed back for about 6 inches. Typical damage is shown in Figure 12. The polyethylene bottle broke and the solution was released within the inner pressure vessel. The pressure vessel leaked the dye solution from around the threads of the 4-inch pipe plug onto the Celotex insulation.

Because of the faulty release, low impact velocity, improper container attitude, and the leaking pressure vessel, the test was repeated with another 6M container. The lip of the pressure vessel of this second test unit was wrapped with 1/2-inch wide teflon ribbon thread sealant manufactured by Permacel, New Brunswick, New Jersey. After the test, the container was disassembled;

again the pressure vessel leaked the dye solution from around the threads of the 4-inch pipe (Figure 13). Impact velocity of this container was 124.8 fps.

A third 6M container was assembled; this time the inner pressure vessel threaded pipe plug was painted with "leak lock" sealant manufactured by Highside Chemical, Inc., Clifton, New Jersey, prior to final assembly. The container was placed on the tower and tested as before. Impact velocity was 130.4 fps. The inner polyethylene bottle was again broken, but no solution leaked out of the inner pressure vessel. The damage is shown in Figures 14 and 15.

In the impact test, the SP5795 sustained damage to the outer container as shown in Figures 16 and 17. The outer container crushed back to the inner pressure vessel and shattered the foamglas insulation between the two. The flange and lid of the inner pressure vessel were slightly bent by the impact. The foamglas insulation was crushed at the point of impact. The polyethylene bottle leaked solution from around the "O" ring seal (Figure 18), but no solution leaked from the pressure vessel. Impact velocity of this container was 130.7 fps.

In the impact test, the L-10 sustained damage to the outer container as shown in Figure 19. The lid was driven back into the inner pressure vessel, and the inner pressure vessel vent valve guard was damaged (Figure 20). Some vermiculite was lost from the top of the container. The steel frame birdcage was bent. The polyethylene bottle leaked from the vent inside the pressure vessel, but the pressure vessel did not leak the solution.

Fire Tests

In the fire test environment, the 6M container lid joint ruptured, and the lid pulled away from the container (Figure 23), so that the Celotex insulation was exposed. This was probably caused by the container internal pressure buildup in the nonvented 6M container. The Celotex was charred all the way in to the pressure vessel at the exposed top end (Figure 24); the Celotex around the circumference of the container was charred all the way in to the pressure vessel for about 120° (Figure 25). The polyethylene bottle, which reached a temperature of 400° to 450°F, partially melted and thereby released the solution to the inside of the pressure vessel. The pressure vessel vented the solution vapors. Visual detection of the leakage was impossible because of the charring of the exterior of the pressure vessel and the insulation.

In the fire environment, the lid joint of the SP5795 ruptured, probably because the container was not vented, and the lid joint provided a good seal. Opening of this joint exposed the foamglas insulation directly to the fire; some of the foamglas was melted (Figure 26). Charring of the insulation at the open end was about 2 inches deep. Charring of the circumferential foamglas was about 2 inches deep maximum in a position at the top side of the container away from the fuel. The polyethylene bottle inside the pressure vessel reached a temperature of approximately 190°F and showed no signs of melting (Figures 27 and 28). There was no leakage from the pressure vessel.

The L-10 container remained intact throughout the test. There was no rupturing of the outer drum, probably because internal pressure was allowed to vent through the six vent holes at the top edge of the drum. The polyvinylchloride bags which contain vermiculite covering the top of the inner pressure vessel were all melted from the heat (Figure 29). The vermiculite was charred to

some extent; but, because it is loose in the outer container, the exact location of charring is difficult to measure. The pressure vessel and steel frame were not damaged. The polyethylene bottle reached a temperature of about 250°F and showed slight melting on the cap (Figures 30 and 31). The vent in the bottle cap permitted leakage of the solution into the pressure vessel, but the pressure vessel did not leak.

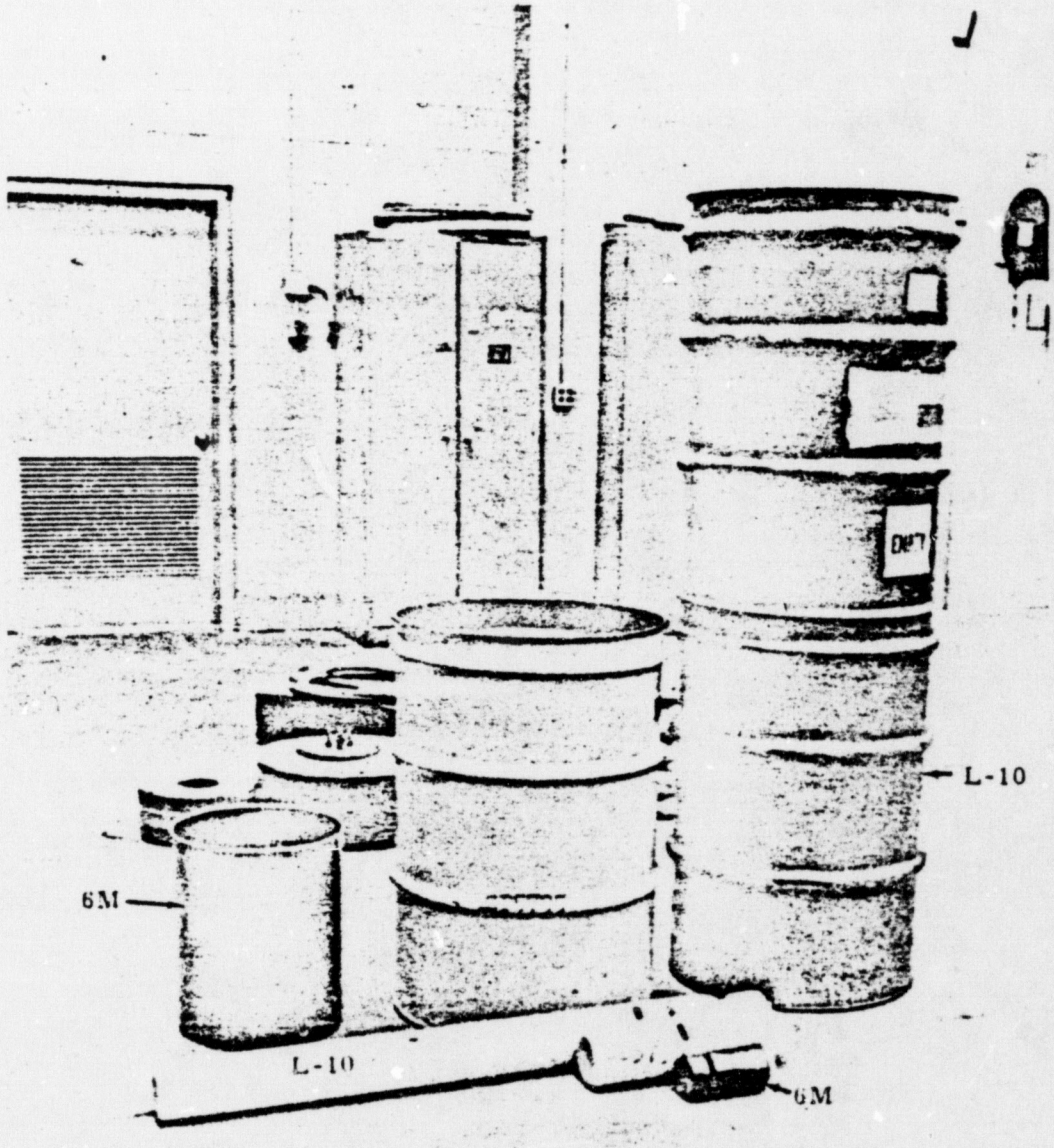


Figure 1. Containers Prior to Final Assembly

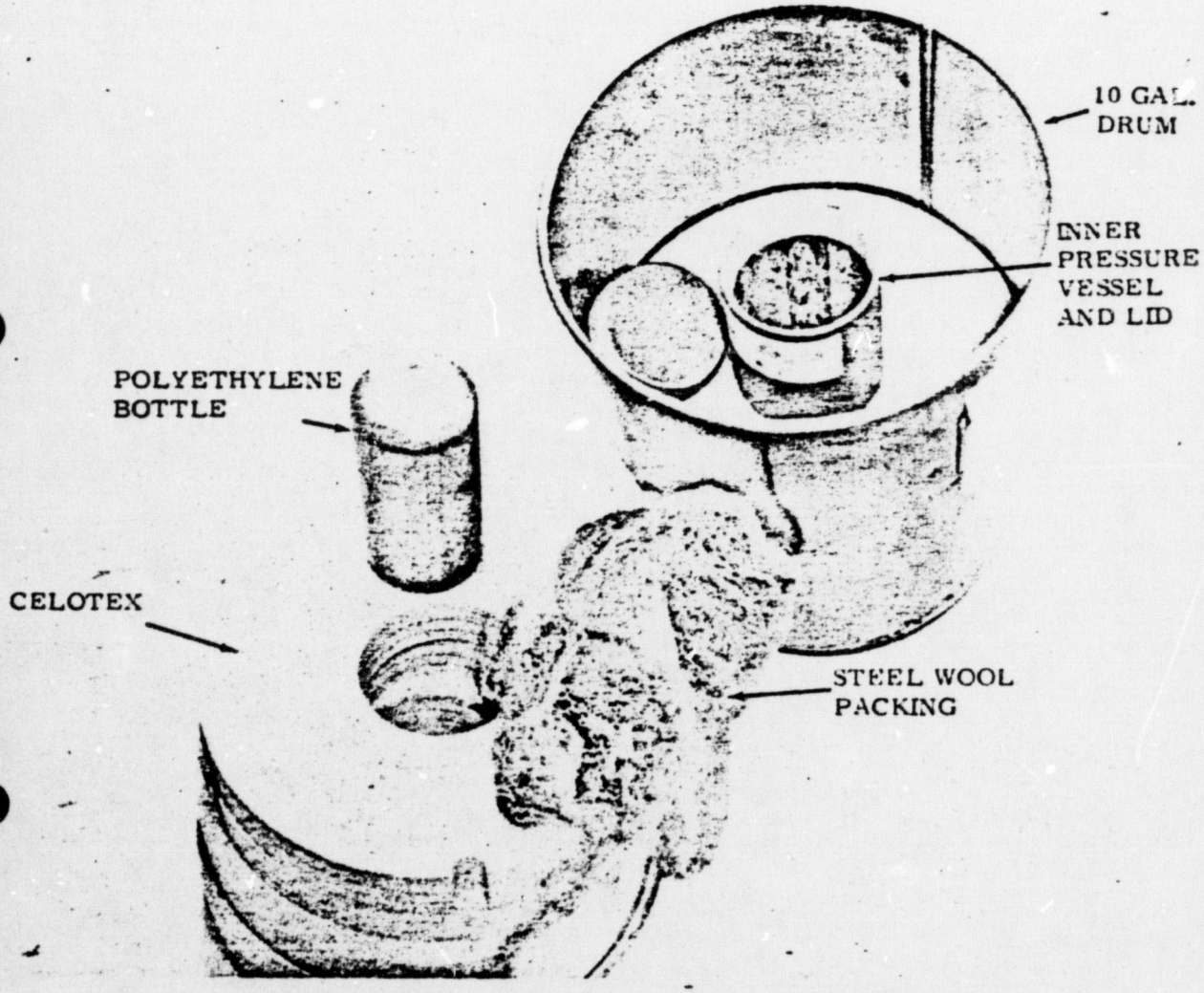


Figure 2. Assembly of the 6II (10 gal) Shipping Container

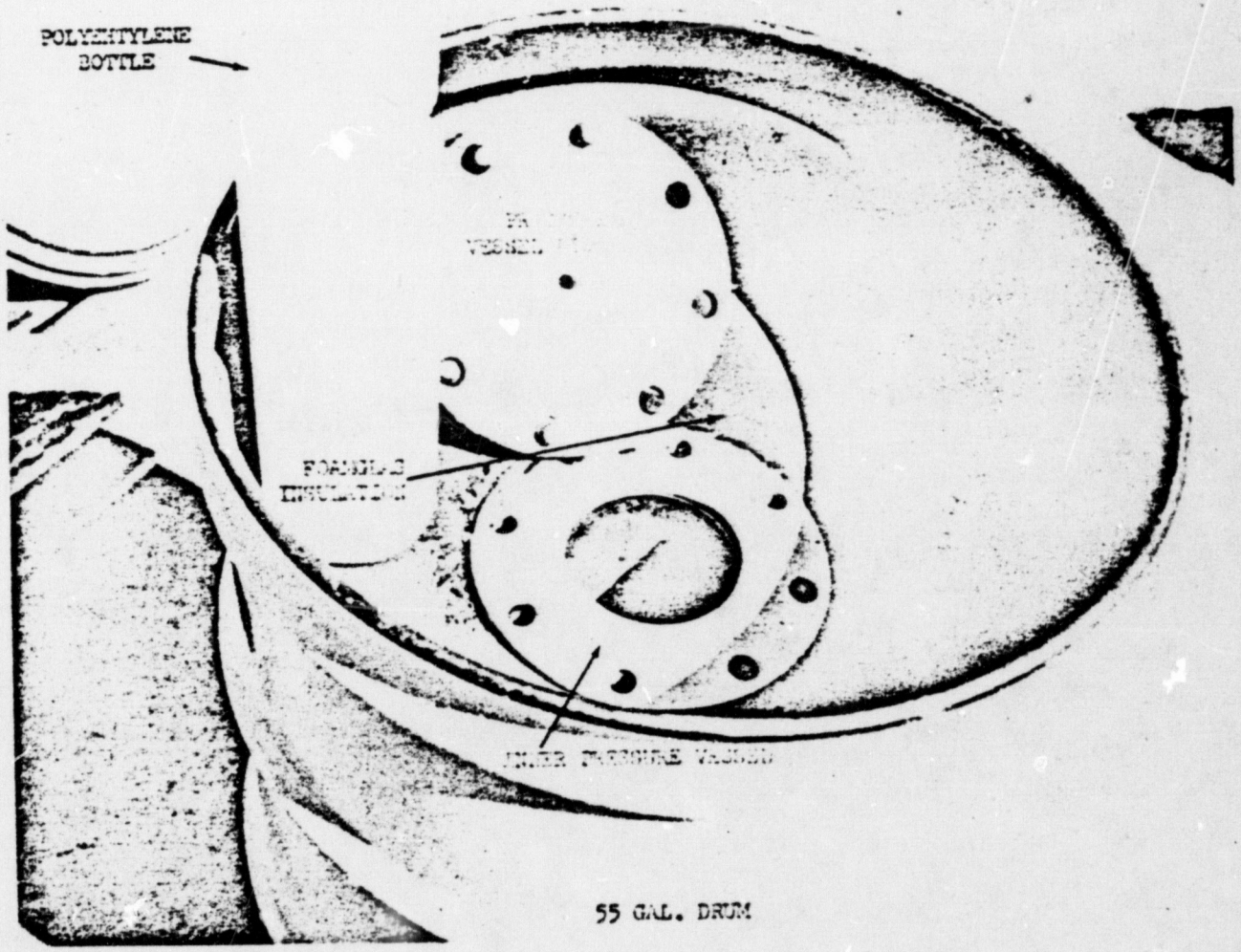


Figure 3. Assembly of the SP5795 (55 gal) Shipping Container

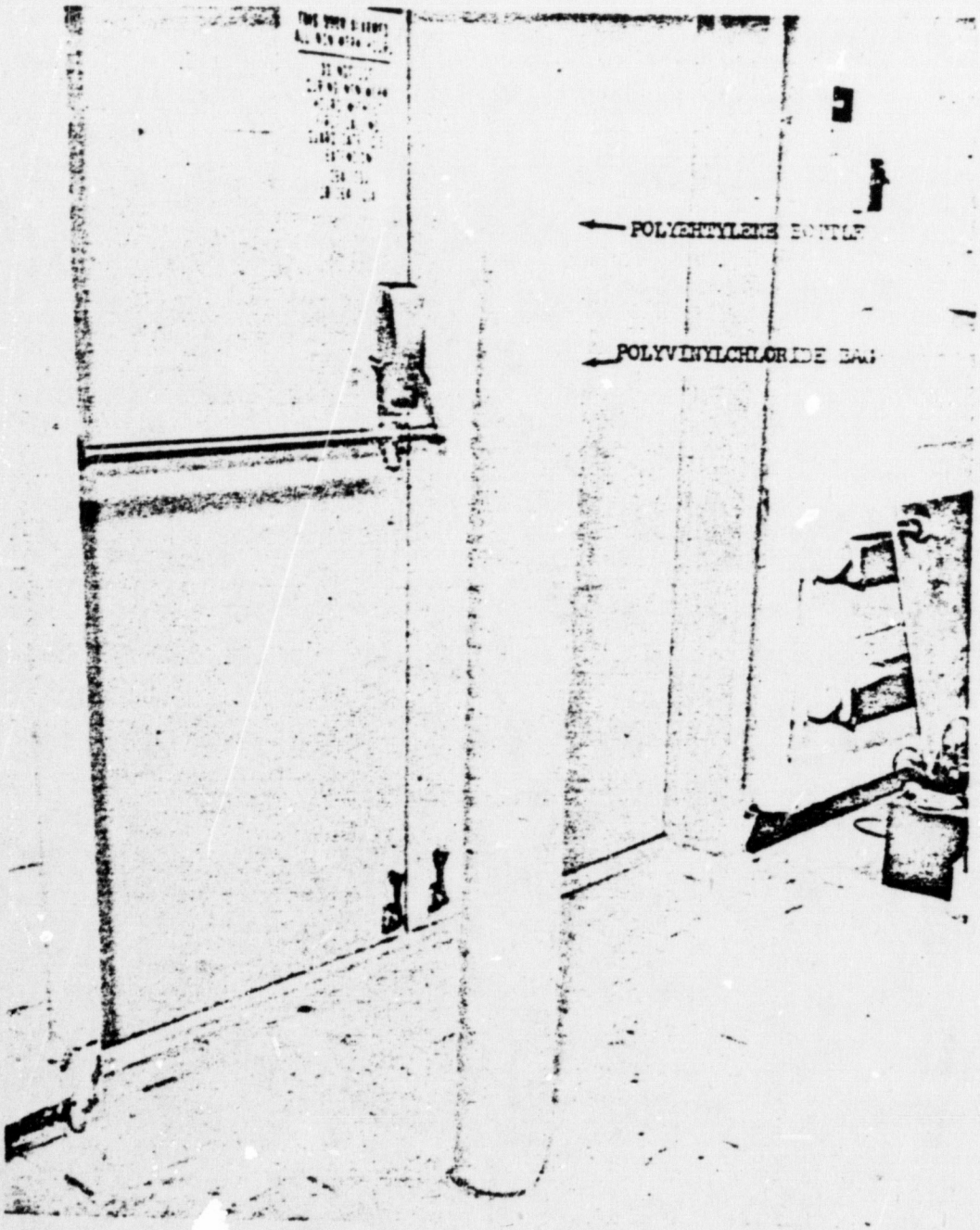


Figure 4. 10-Liter Bottle for L-10 Container

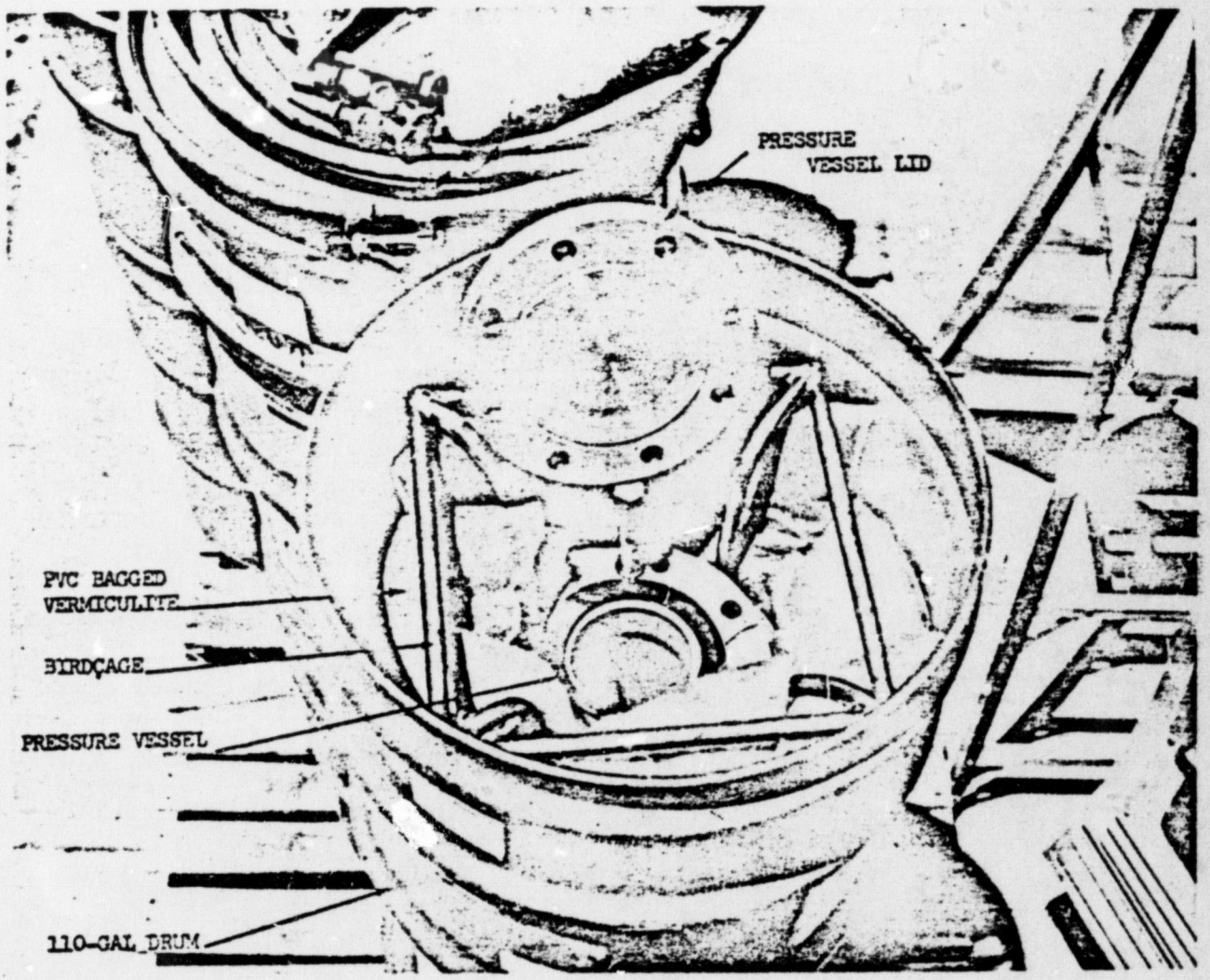


Figure 5. Assembly of the L-10 (110 gal) Shipping Container

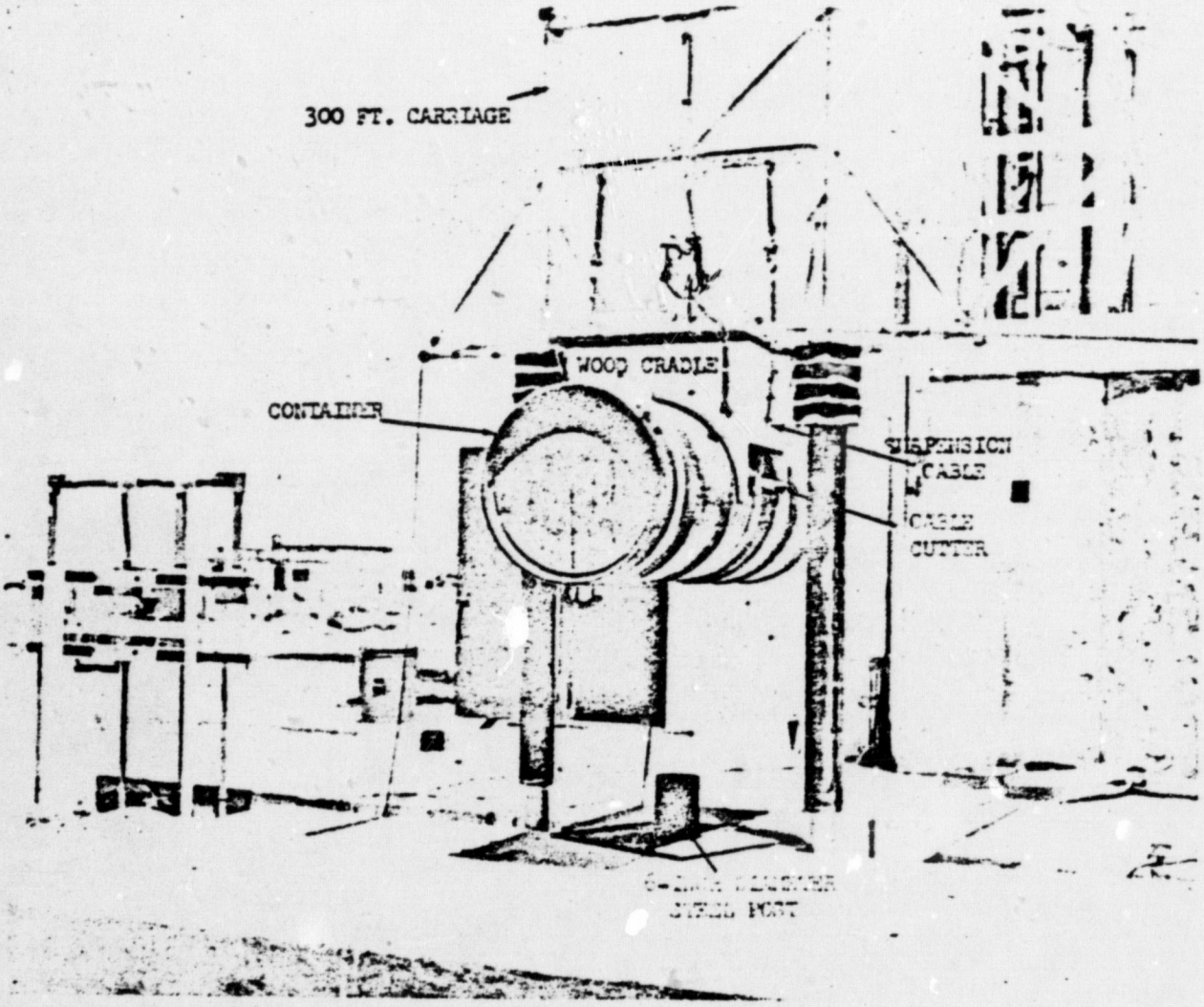


Figure 6. L-10 Container in Typical Setup for Puncture Test

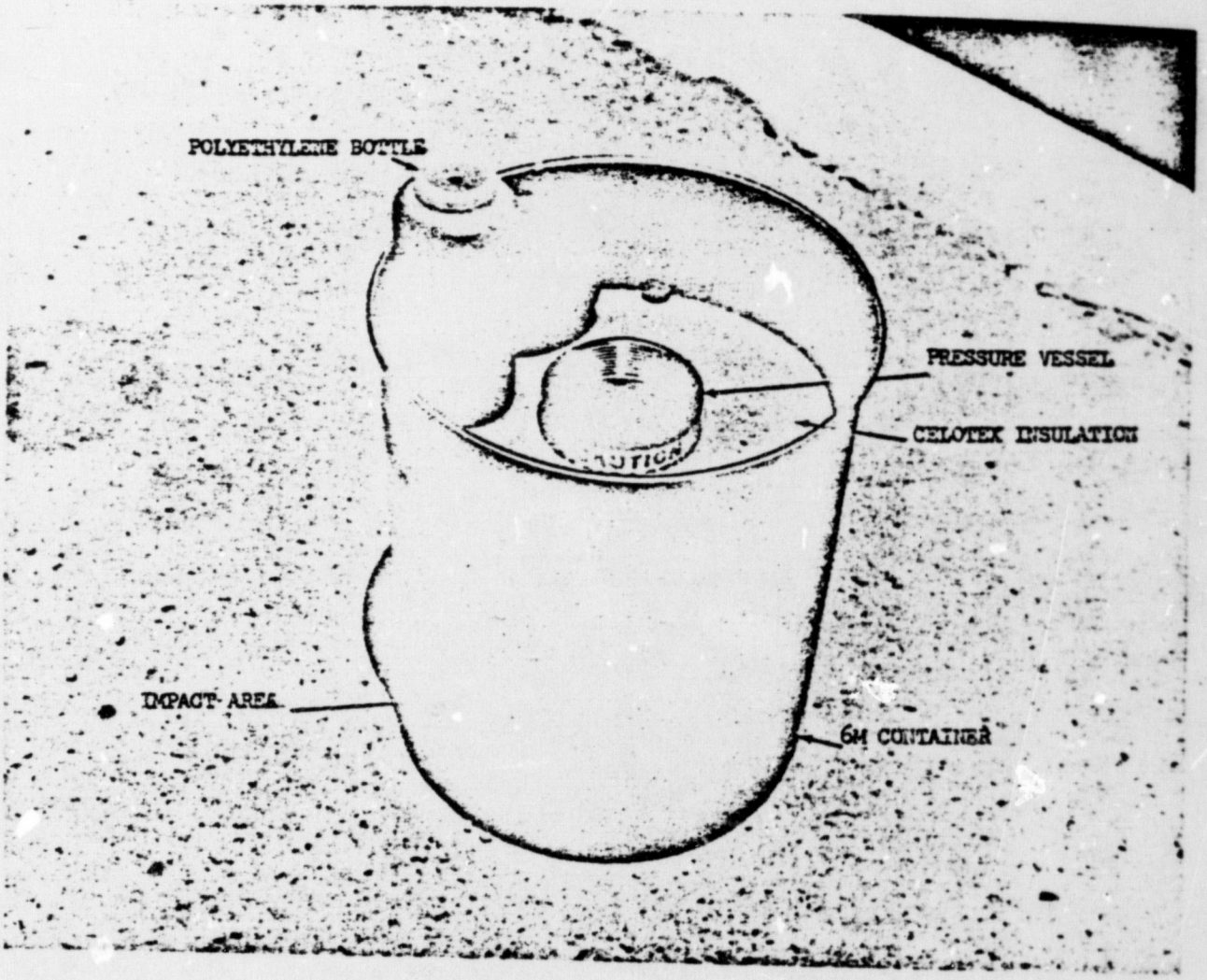


Figure 7. 6M Container Post Puncture Test

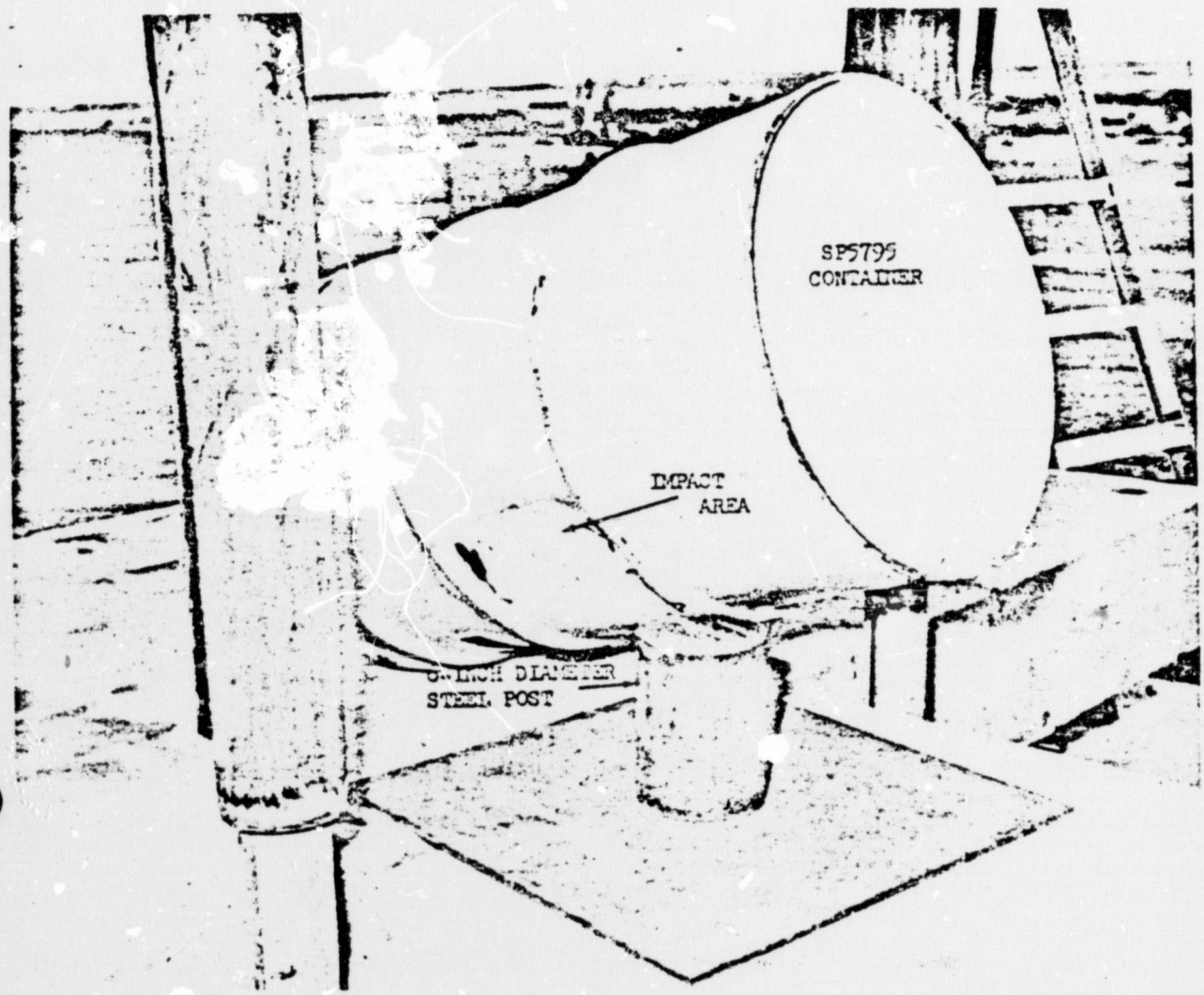


Figure 8. SP5795 Post Puncture Test

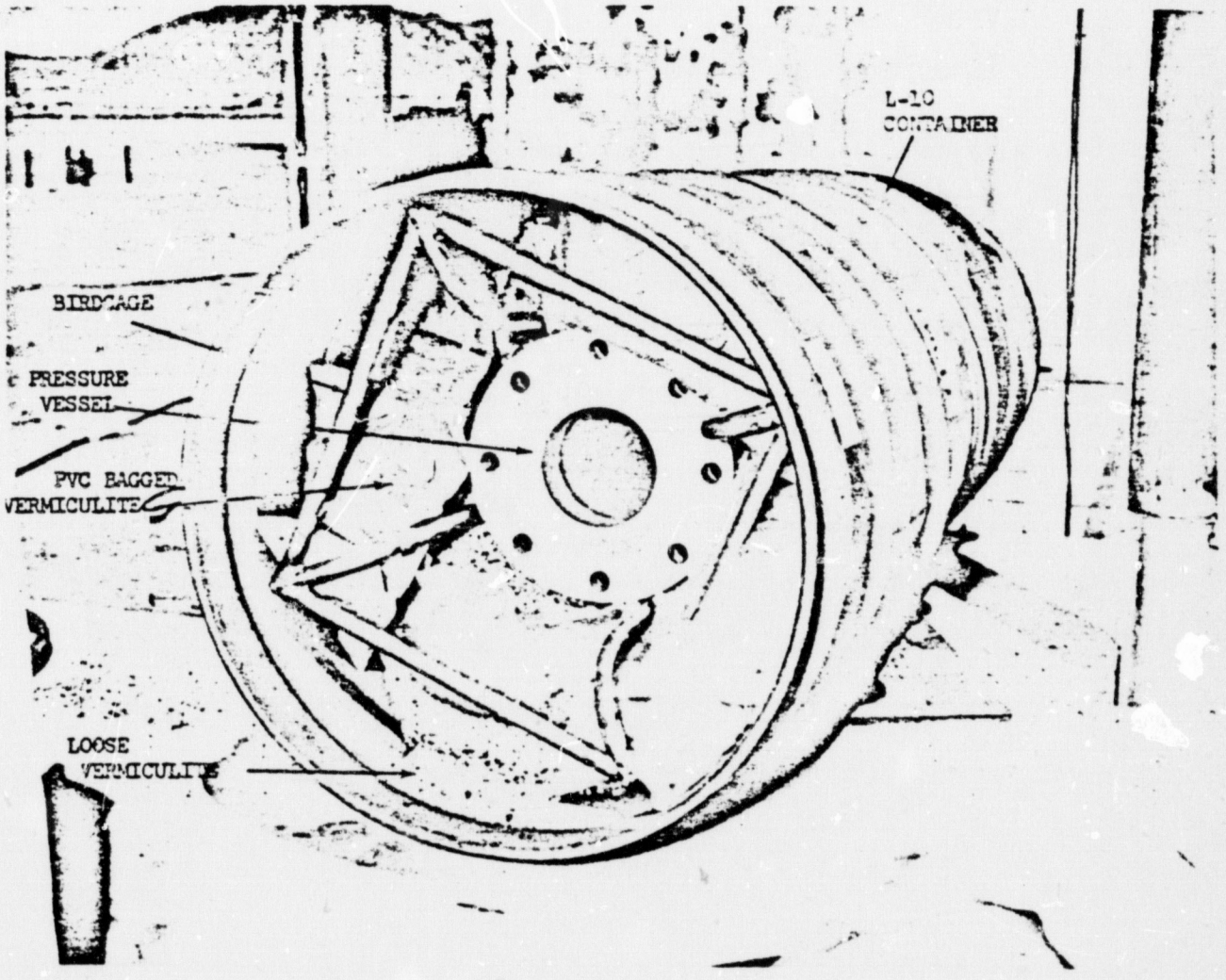


Figure 9. L-10 Post Puncture Test

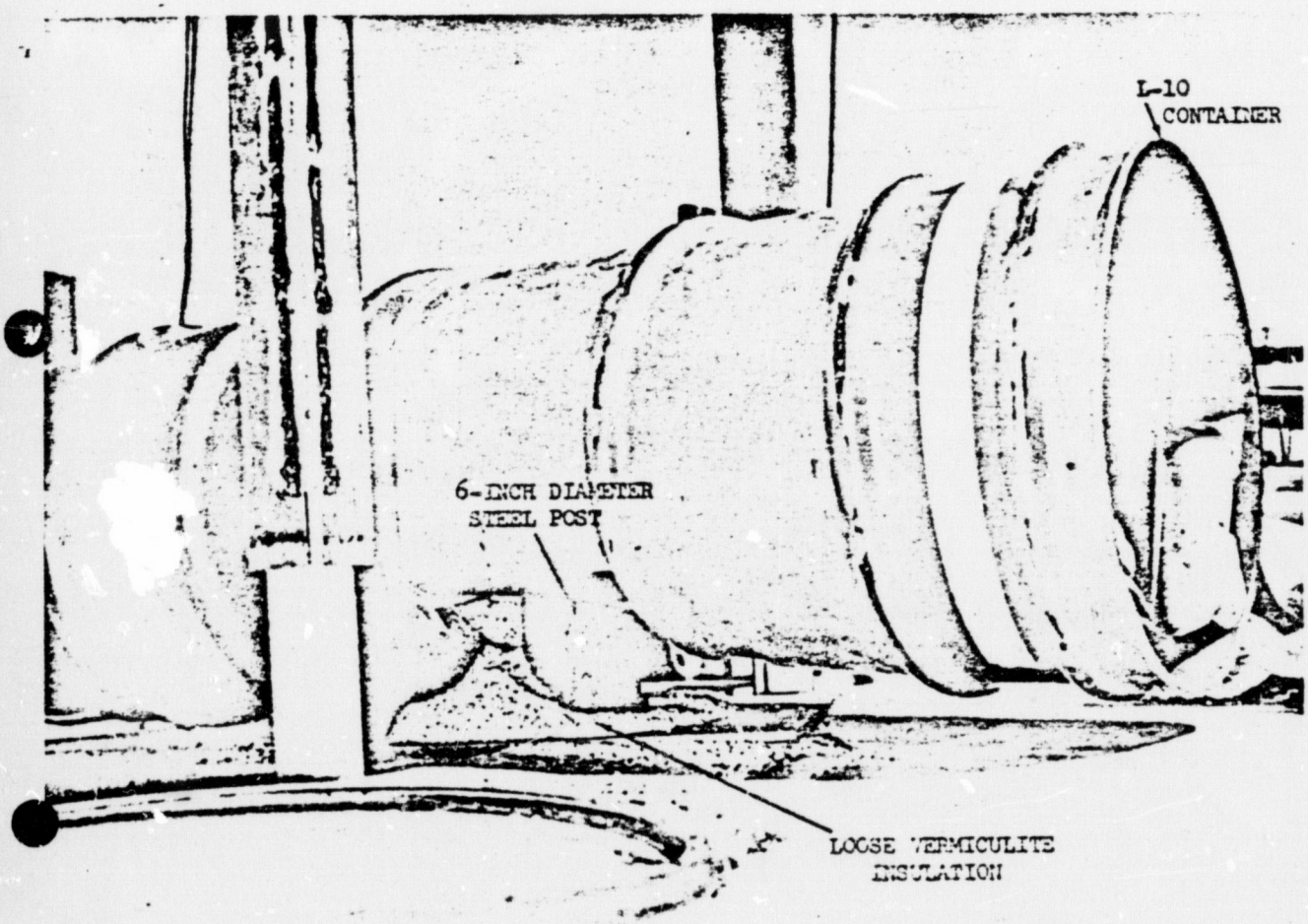


Figure 10. L-10 Post Puncture Test

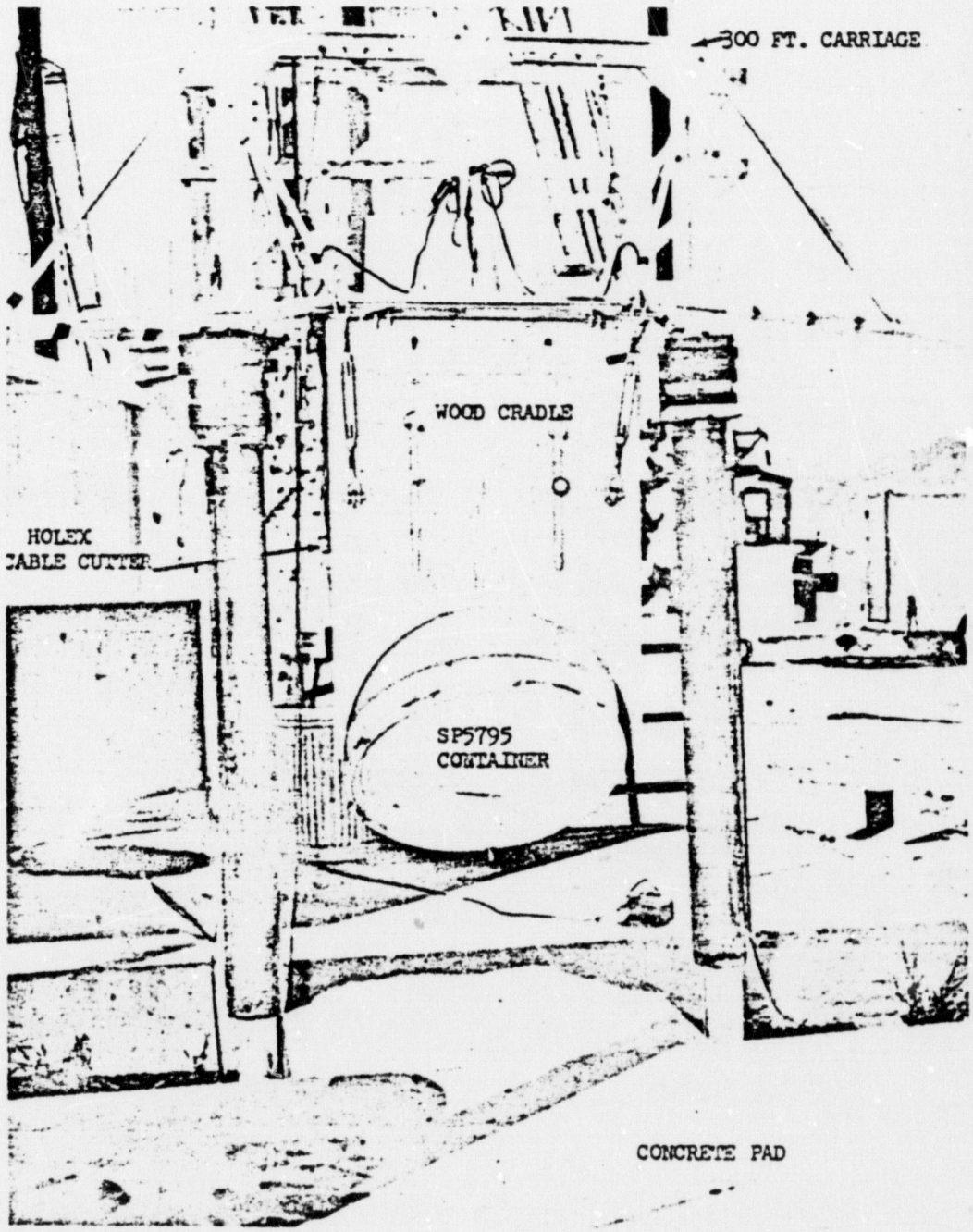


Figure 11. SP5795 Container in Typical Setup for Impact Test



Figure 12. 6M Container Post Impact Test

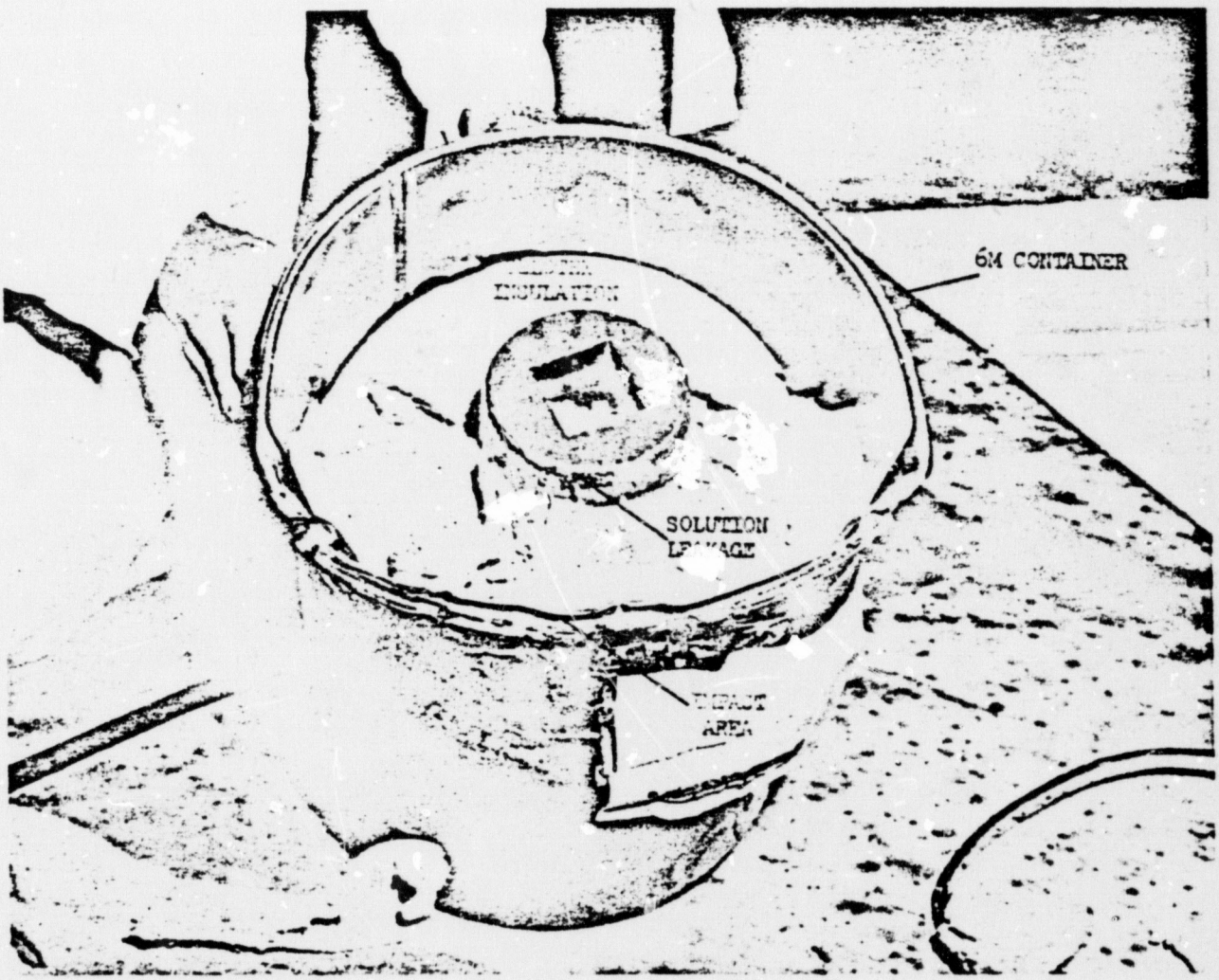


Figure 13. 6M Container Post Impact Test No. 2

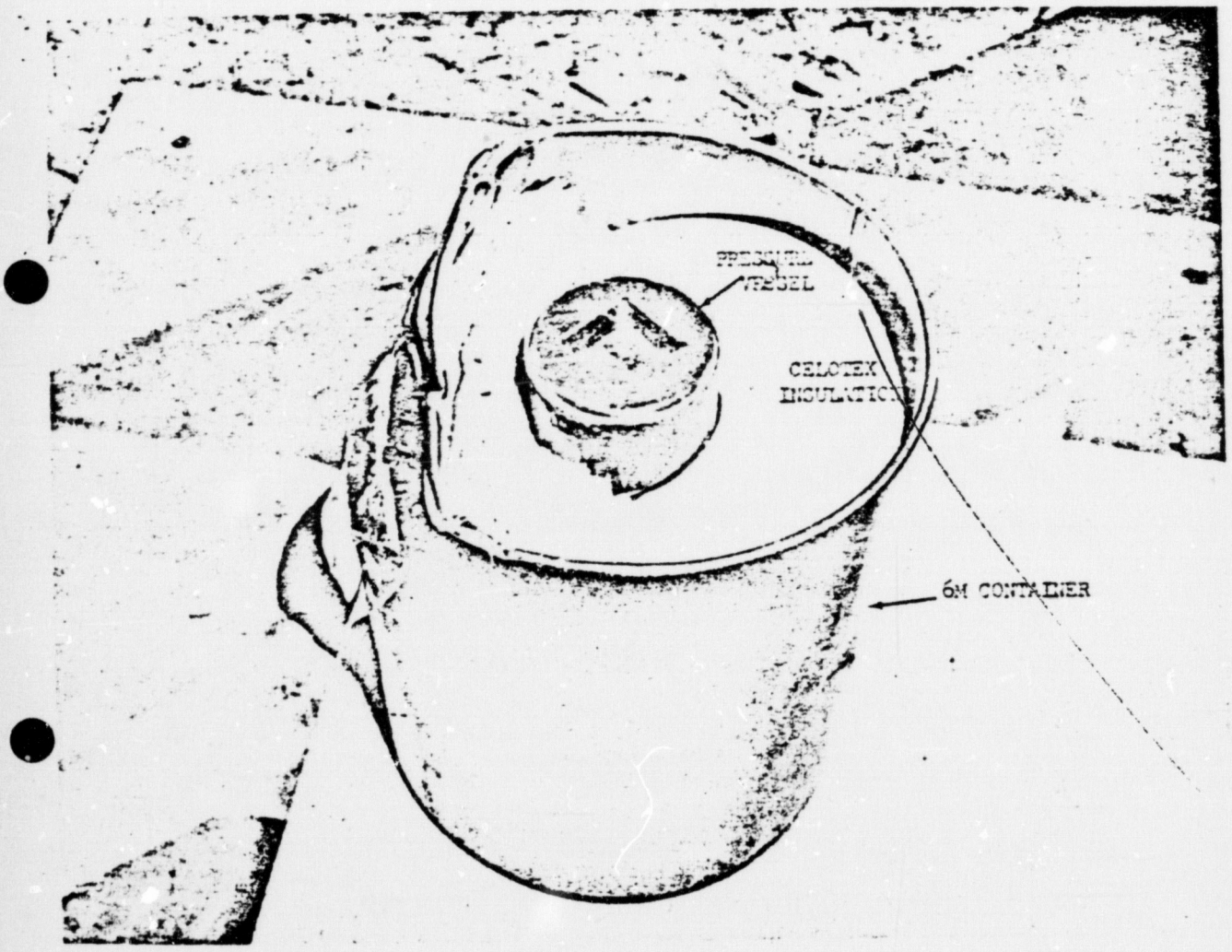


Figure 14. 6M Container Post Impact Test No. 3

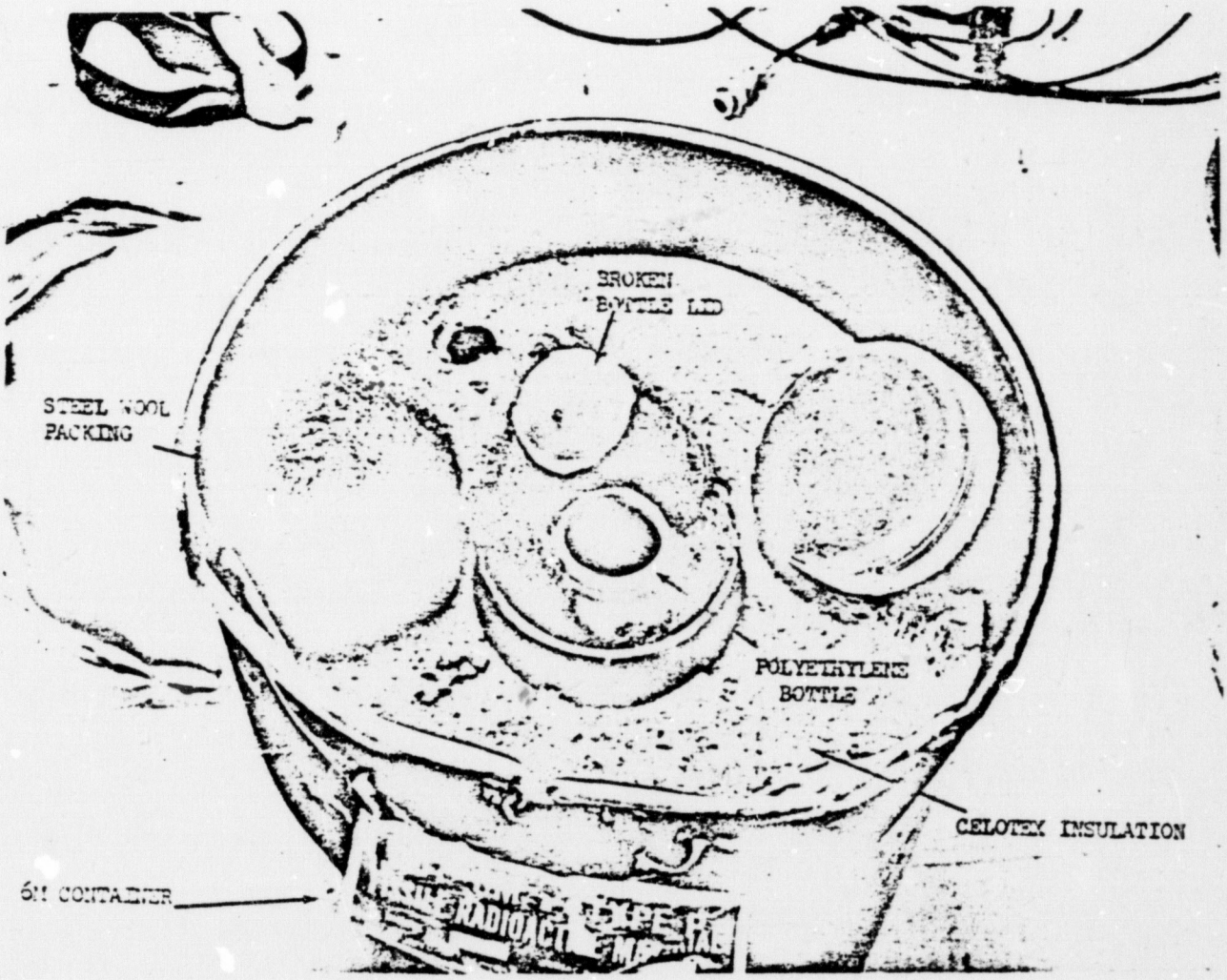


Figure 15. 6M Container Post Impact Test No. 3

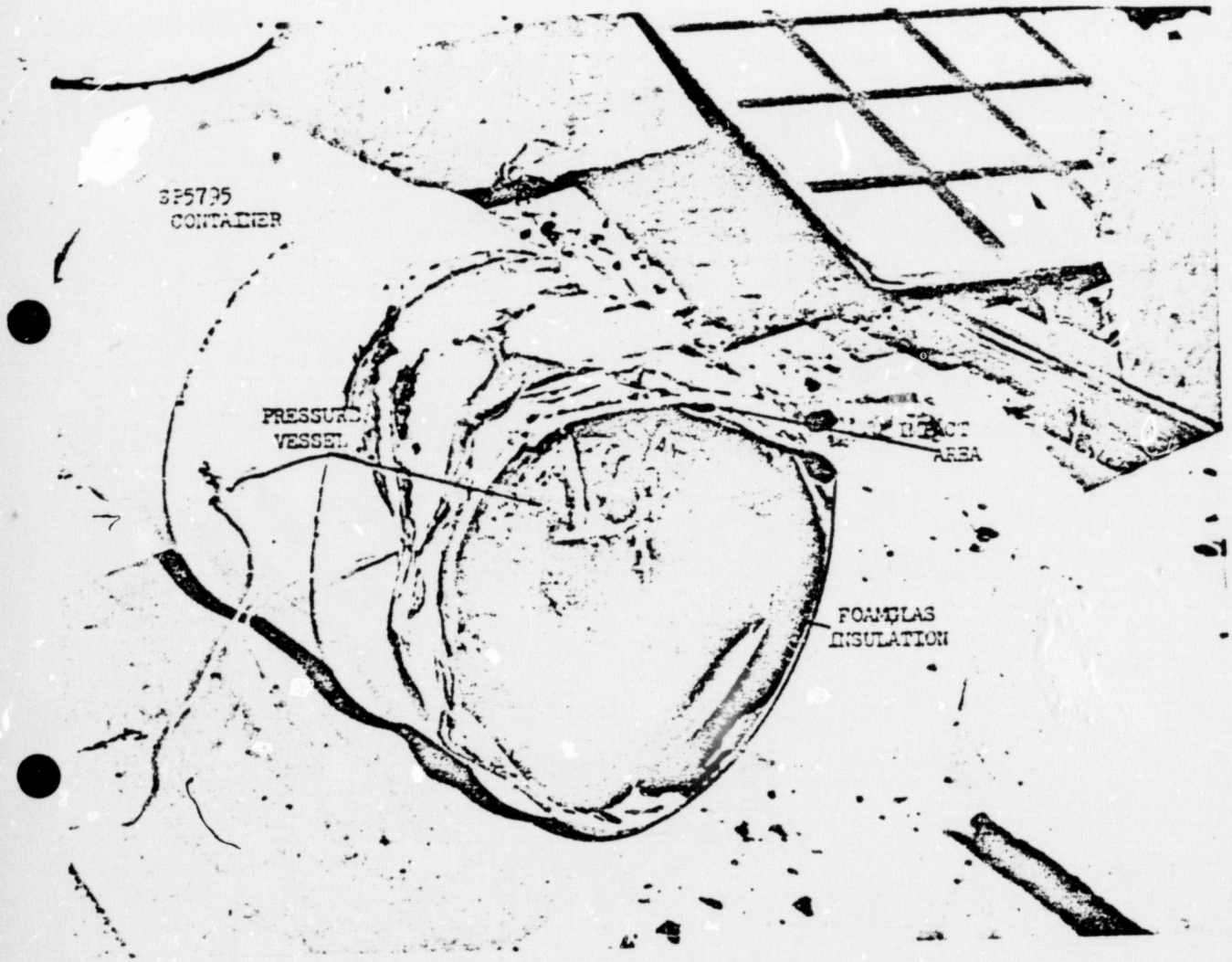


Figure 16. SP5795 Container Post Impact Test

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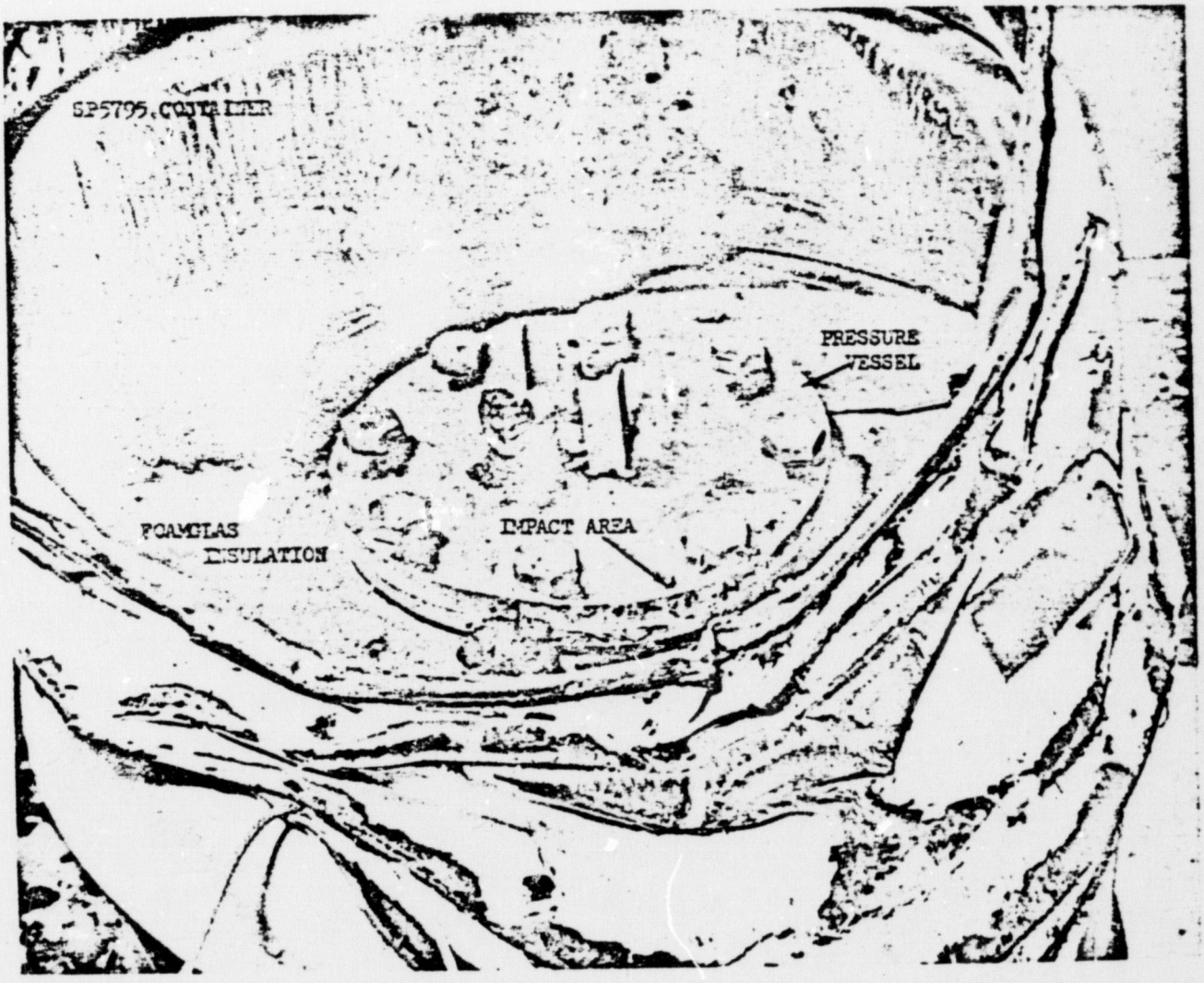


Figure 17. SP5795 Container Post Impact Test, Top Insulation Removed

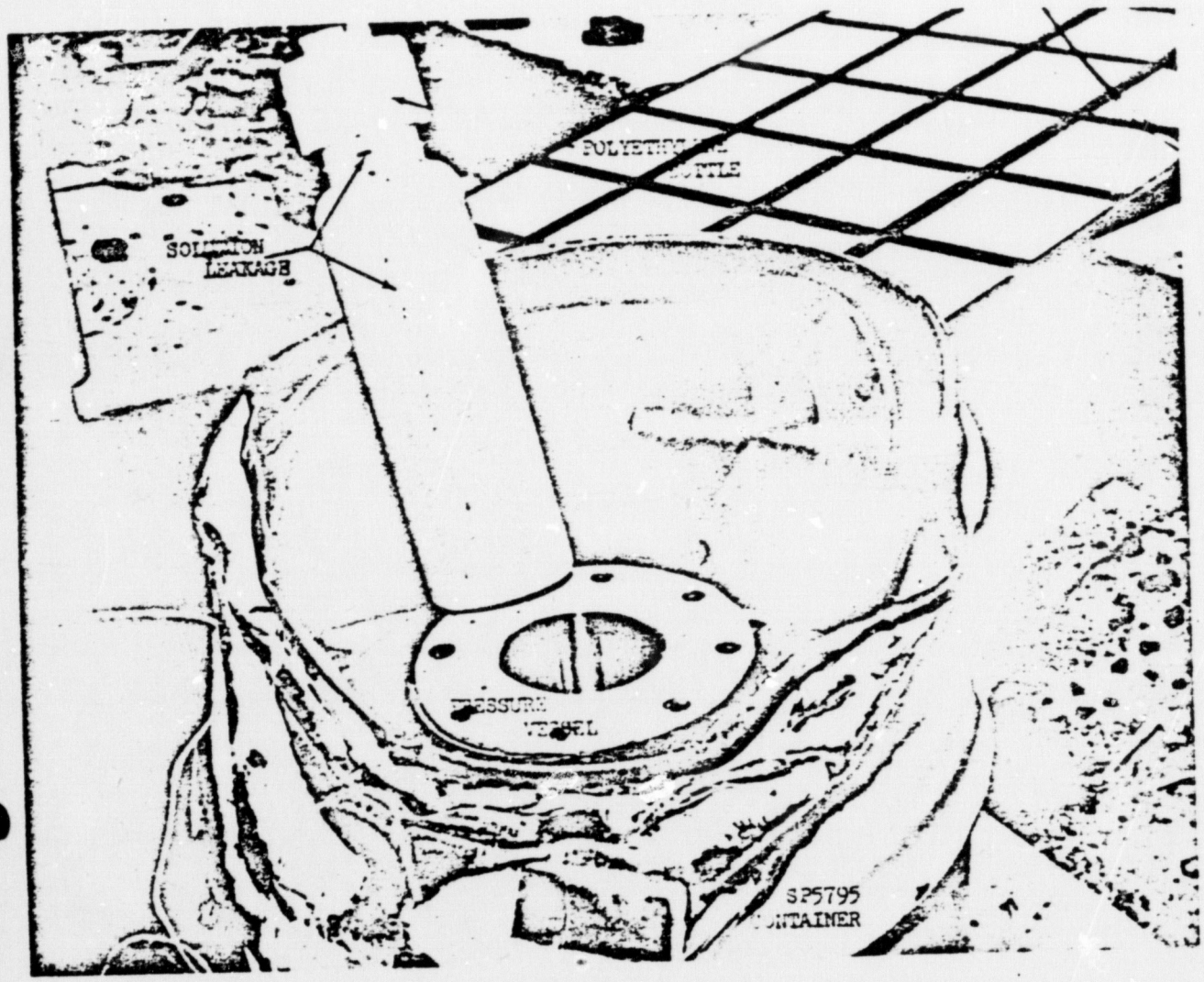


Figure 18. SP5795 Container Post Impact Test, Bottle Removed

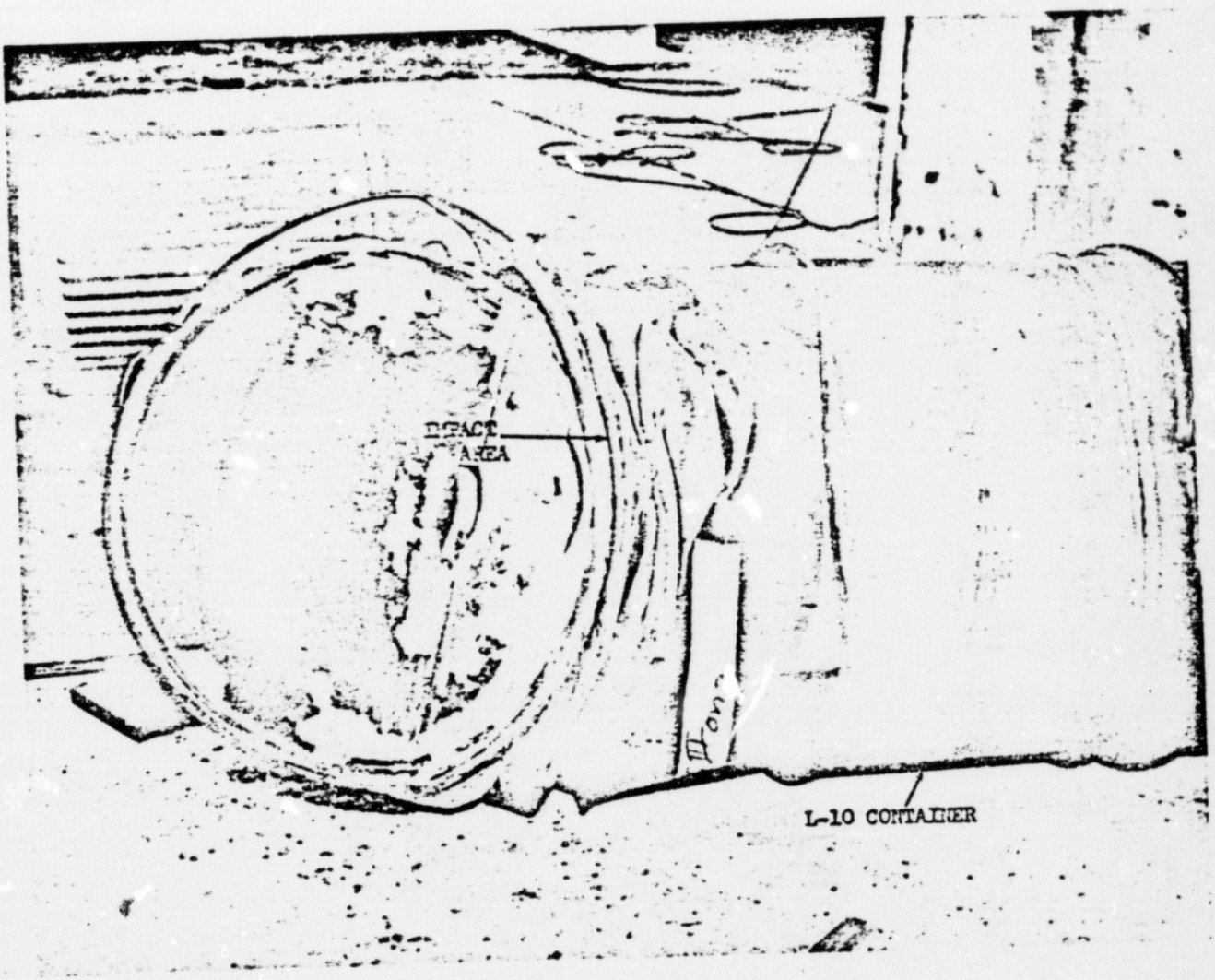


Figure 19. L-10 Container Post Impact Test

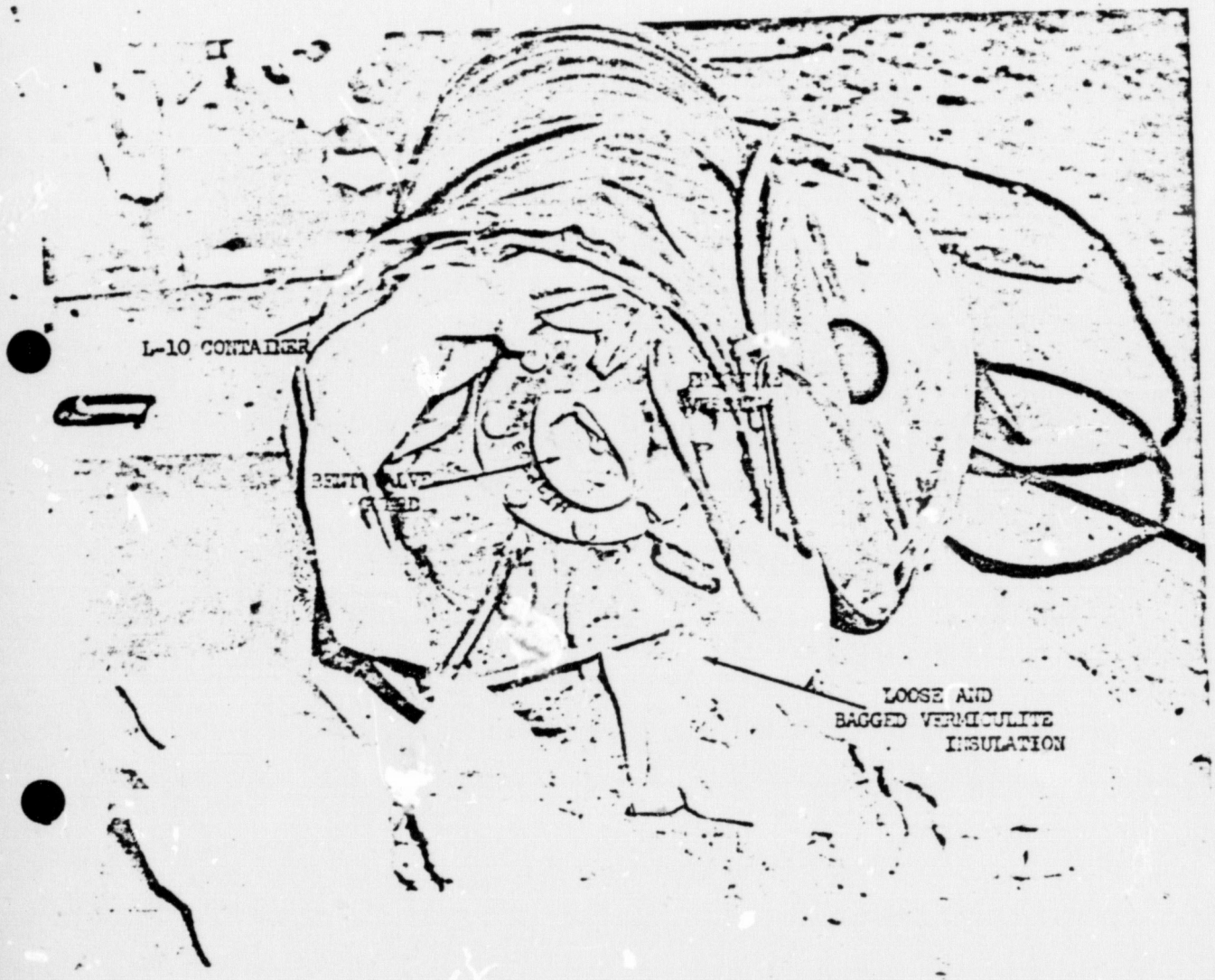


Figure 20. L-10 Container Post Impact Test

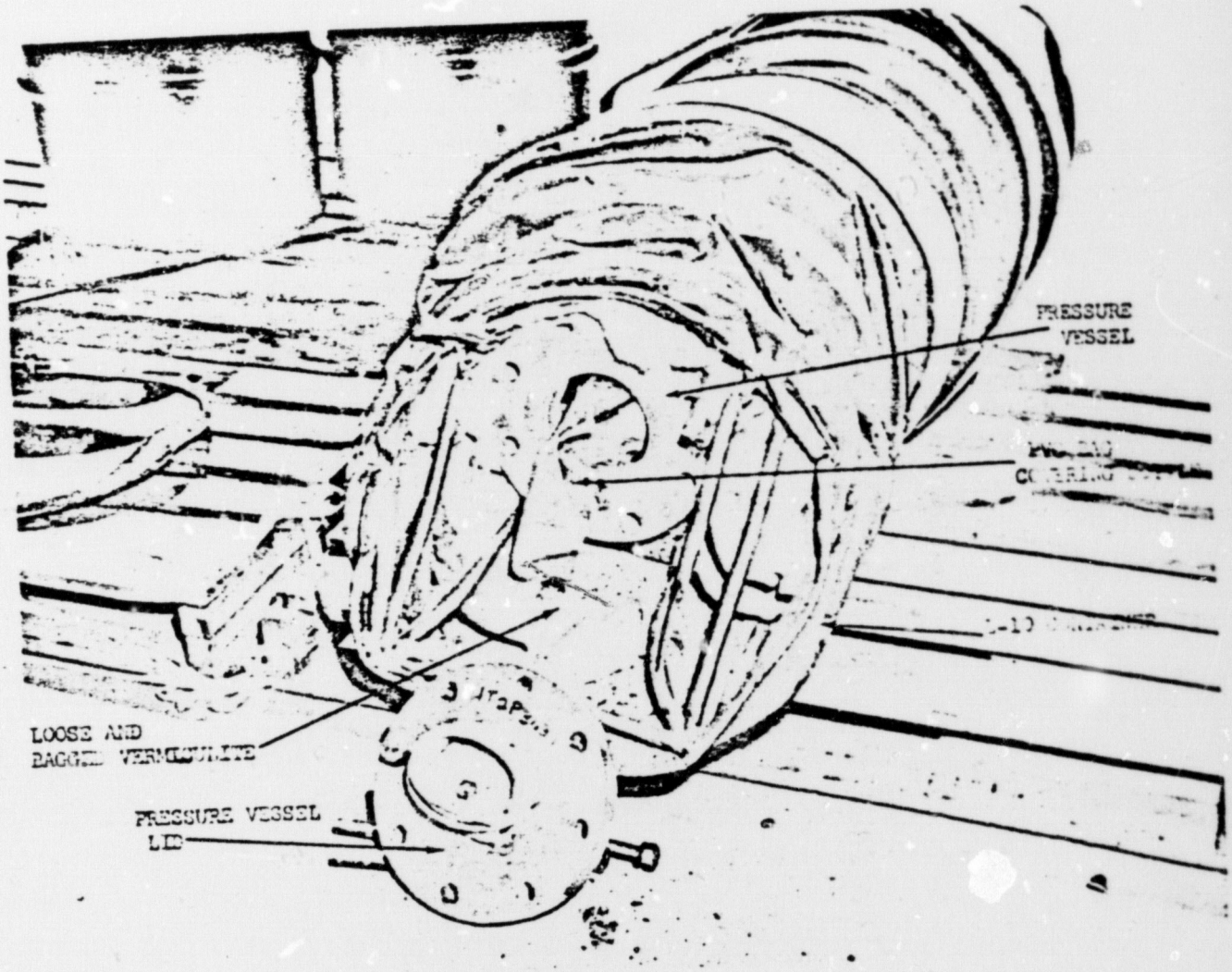


Figure 21. L-10 Container Post Impact Test

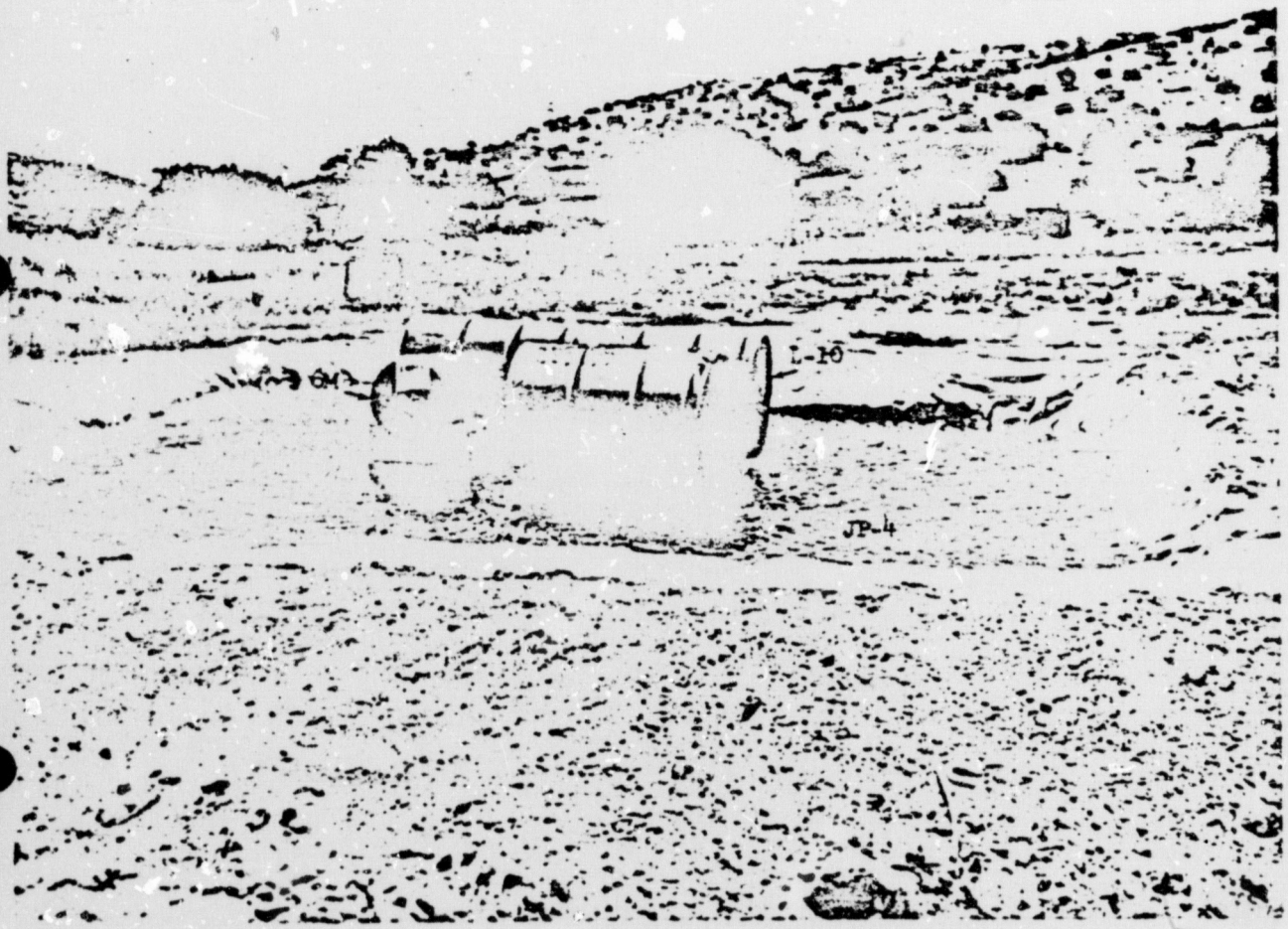


Figure 22. Fire Test Setup

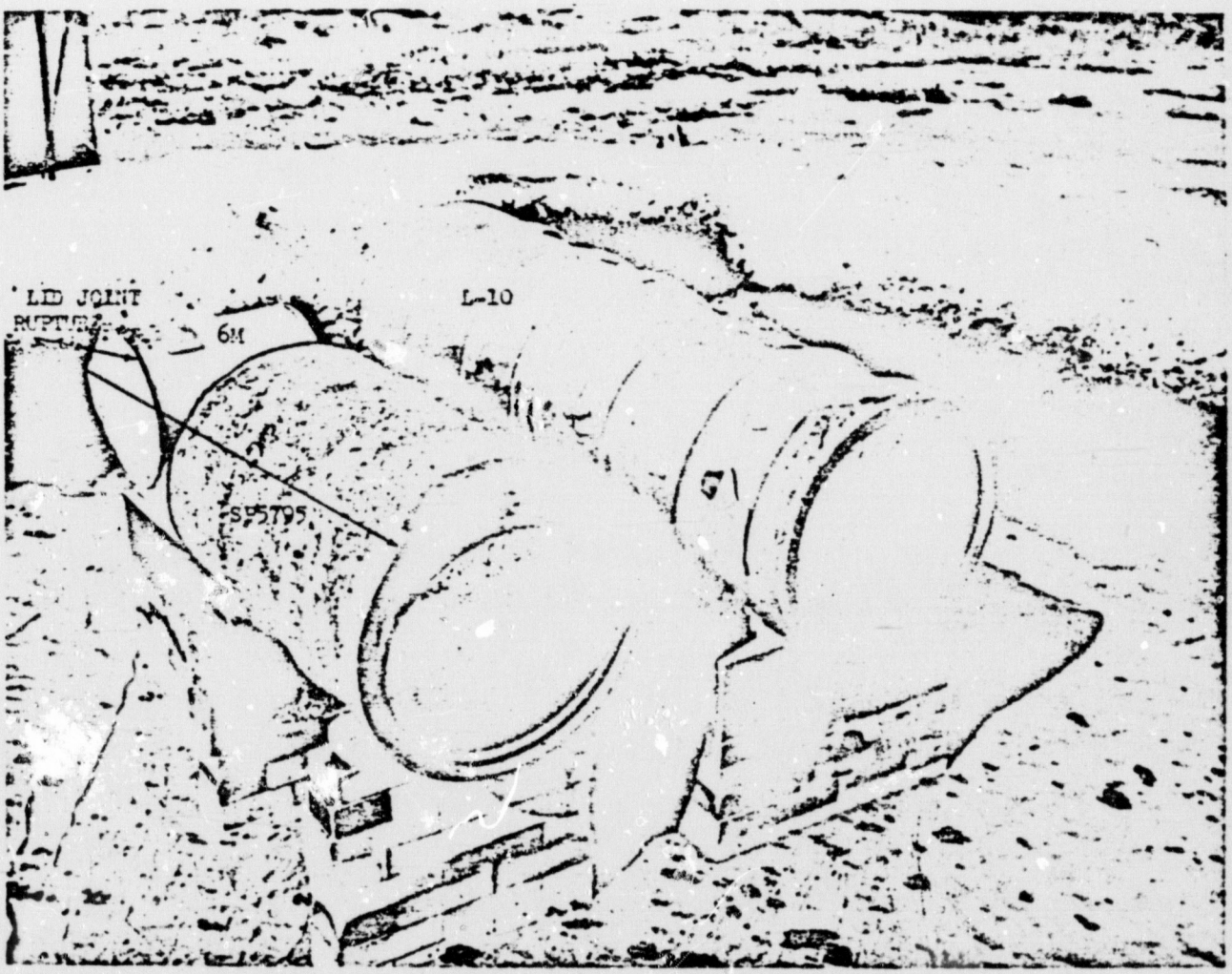


Figure 23. Post Fire Test Showing Lid Joint Rupture

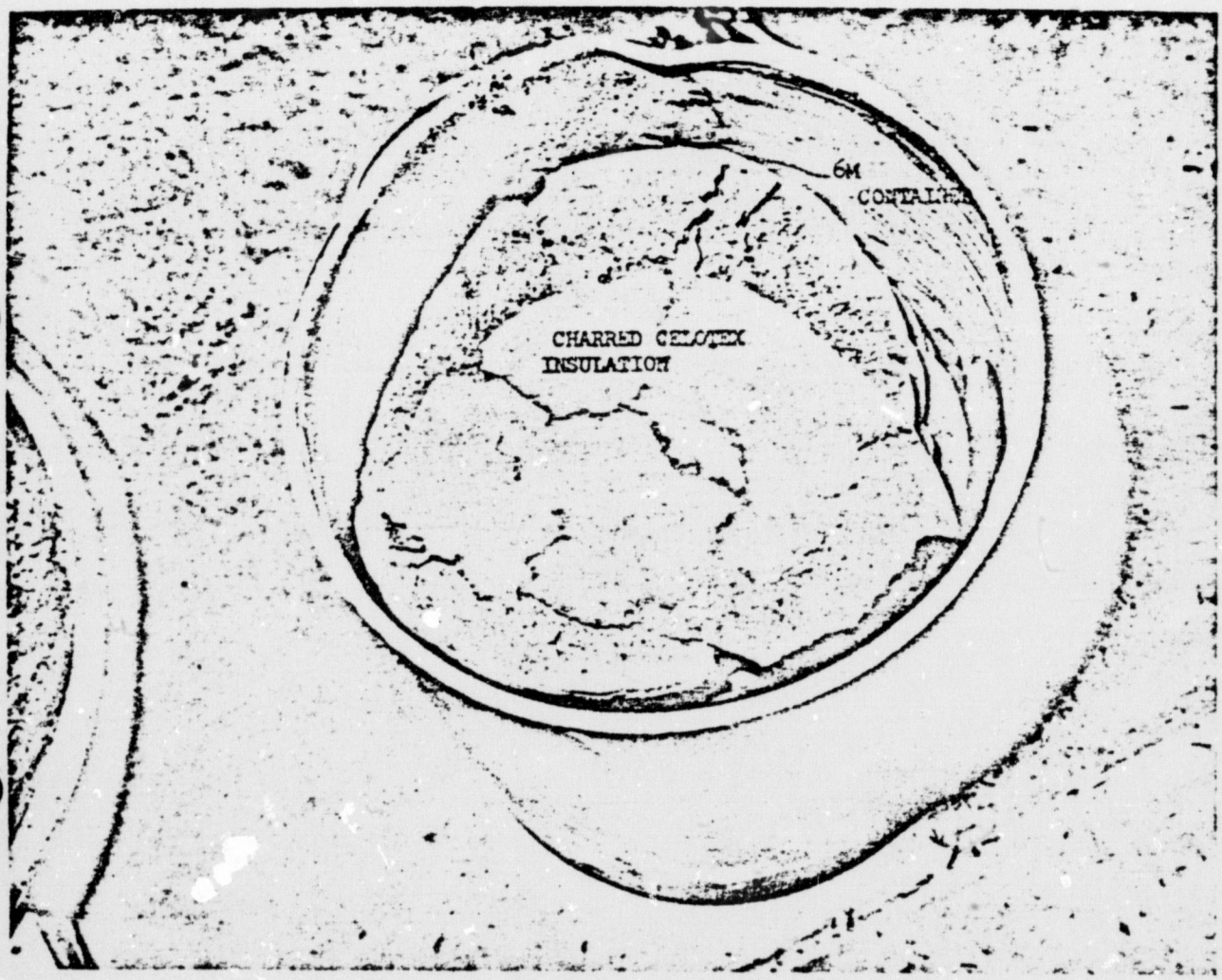


Figure 24. 6M Container Post Fire Test

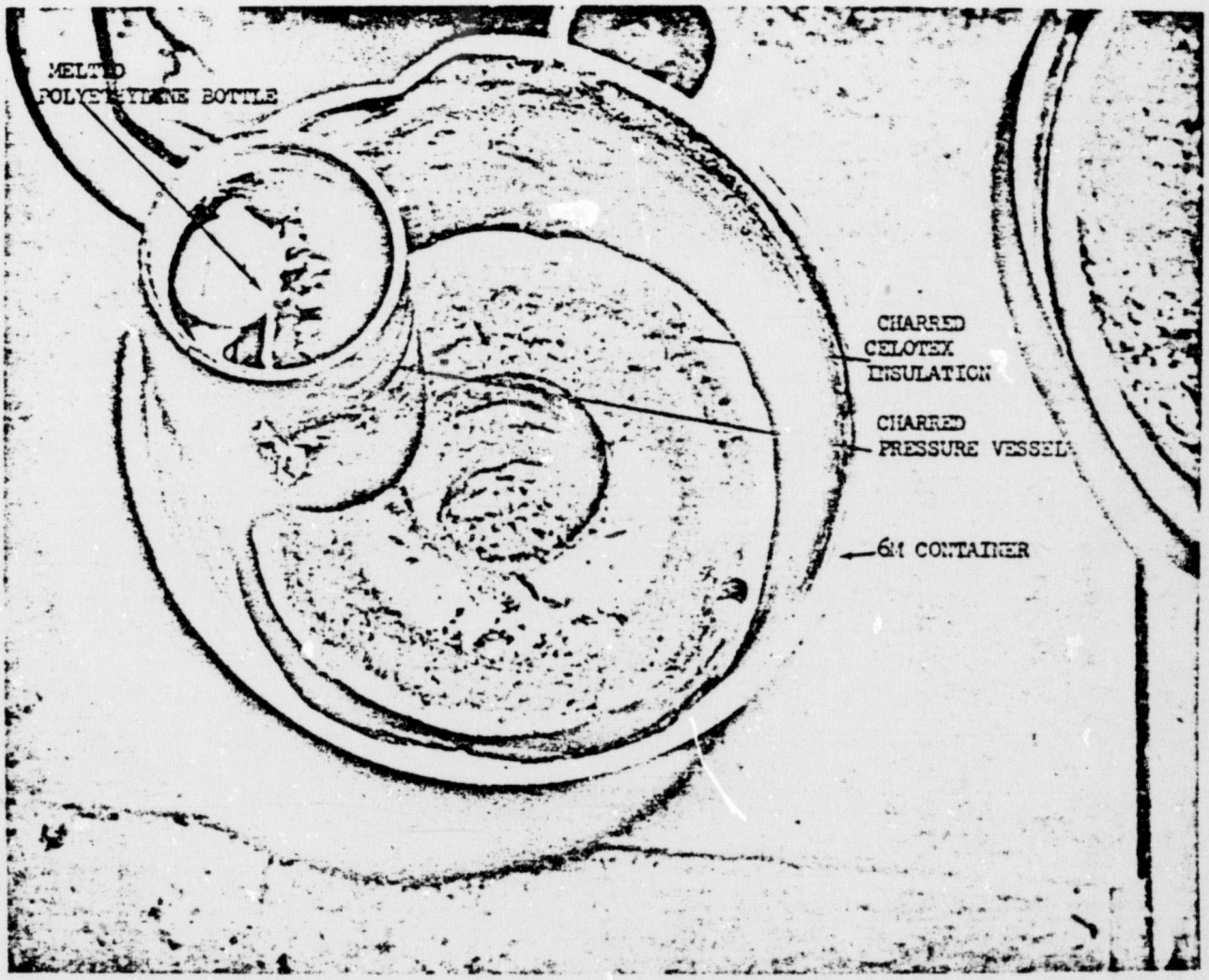


Figure 25. 6M Container Post Fire Test

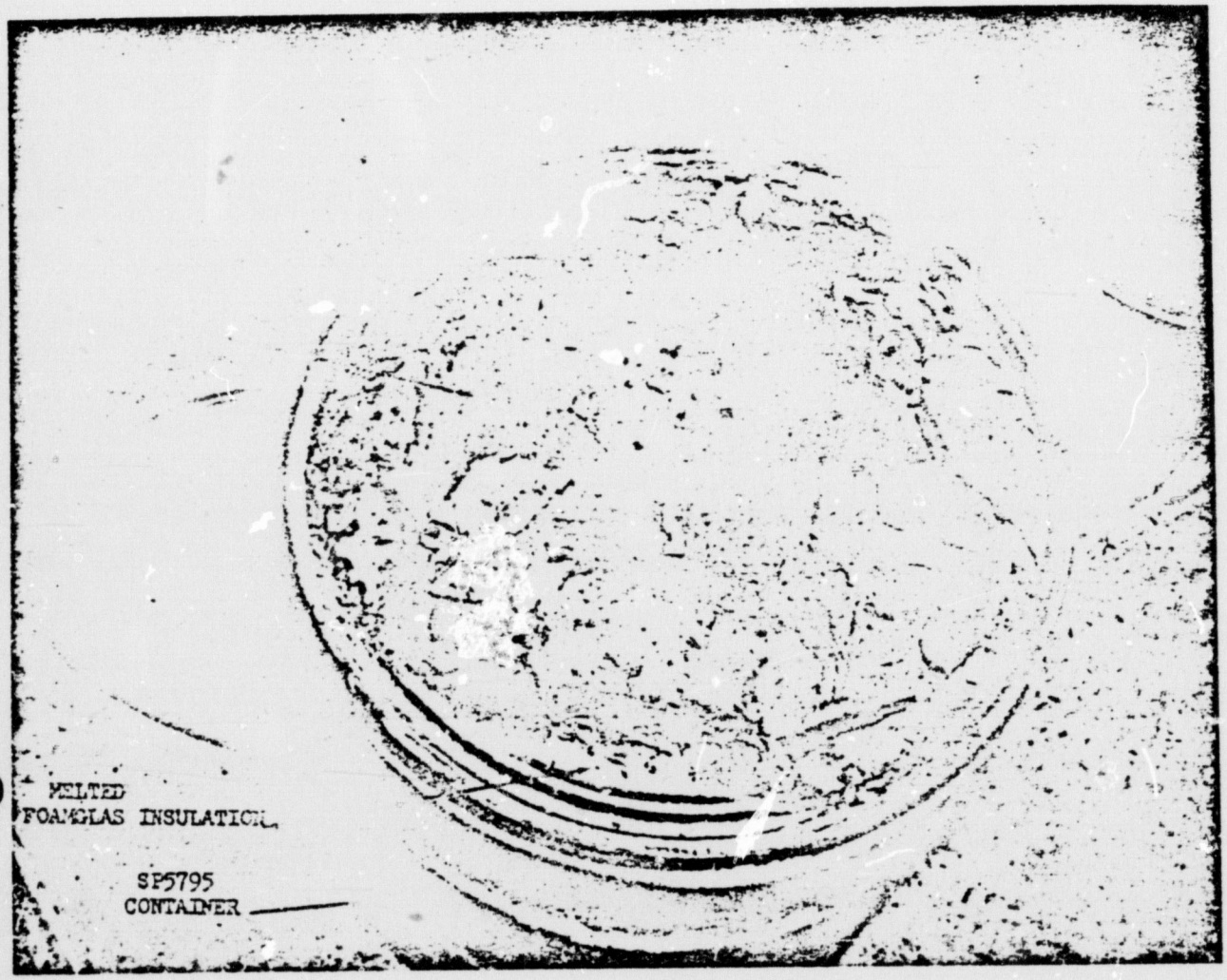


Figure 26. SP5795 Container Post Fire Test

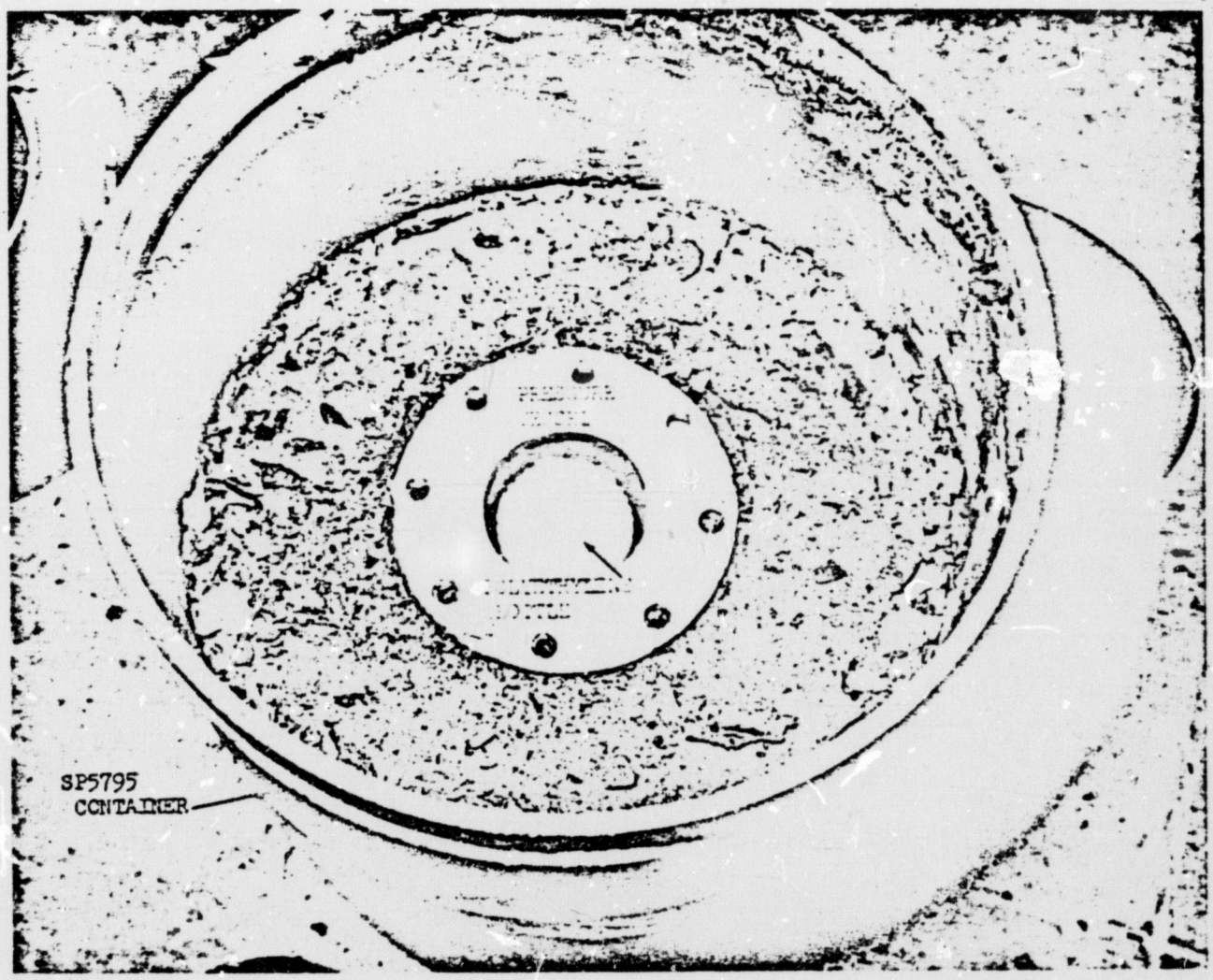


Figure 27. SP5795 Container Post Fire Test

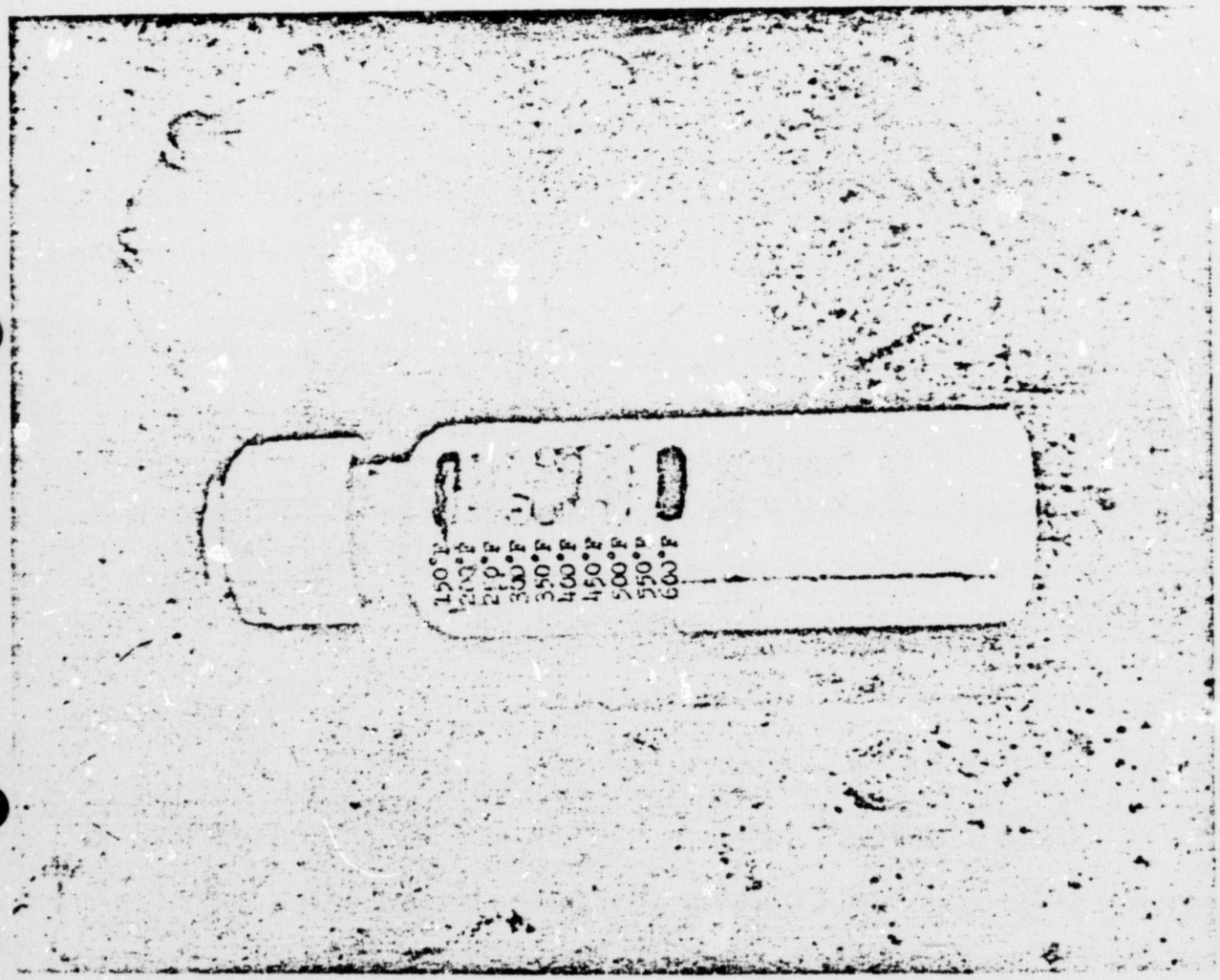


Figure 28. SP5795 Polyethylene Bottle After Fire Test

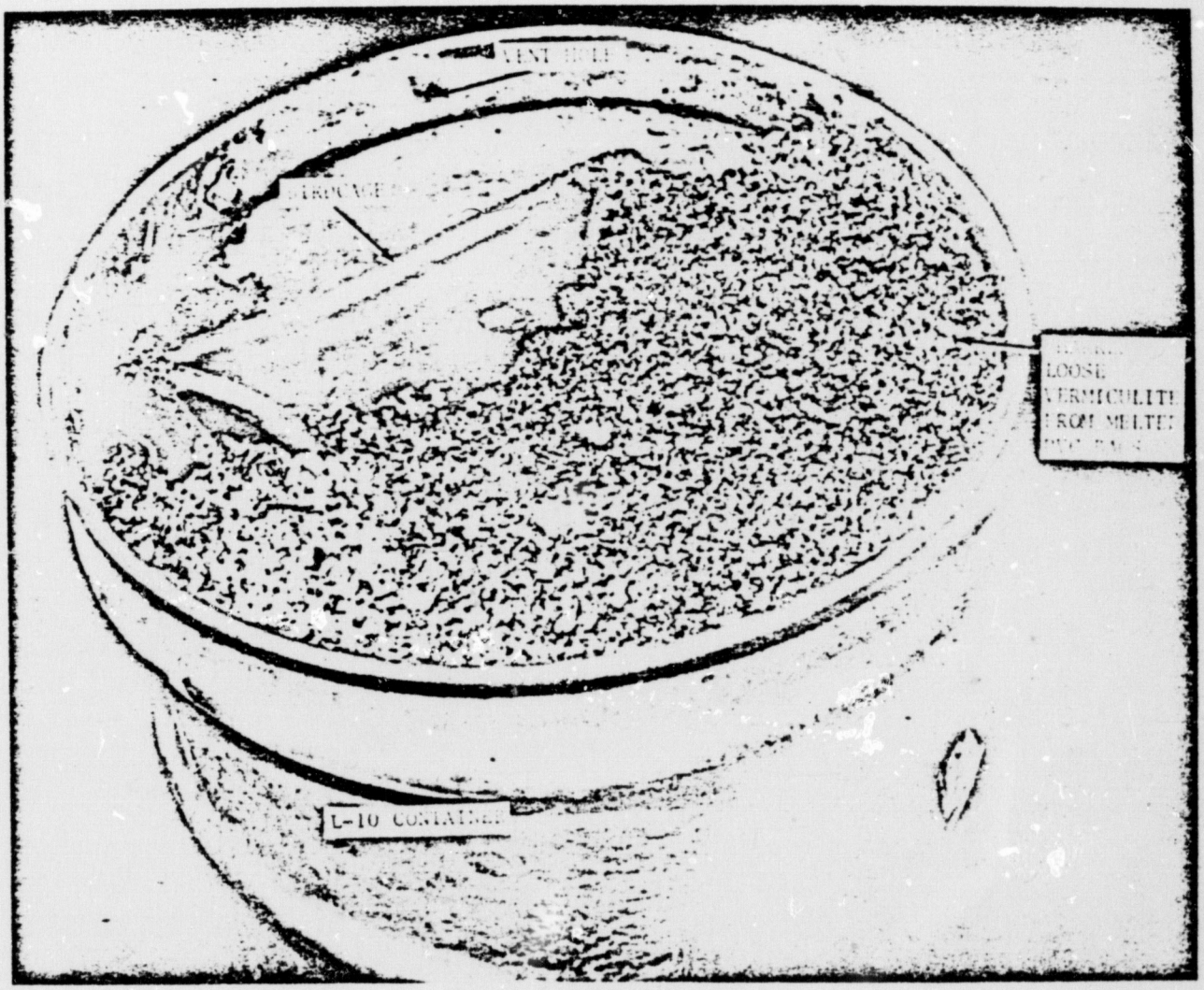


Figure 29. L-10 Container Post Fire Test

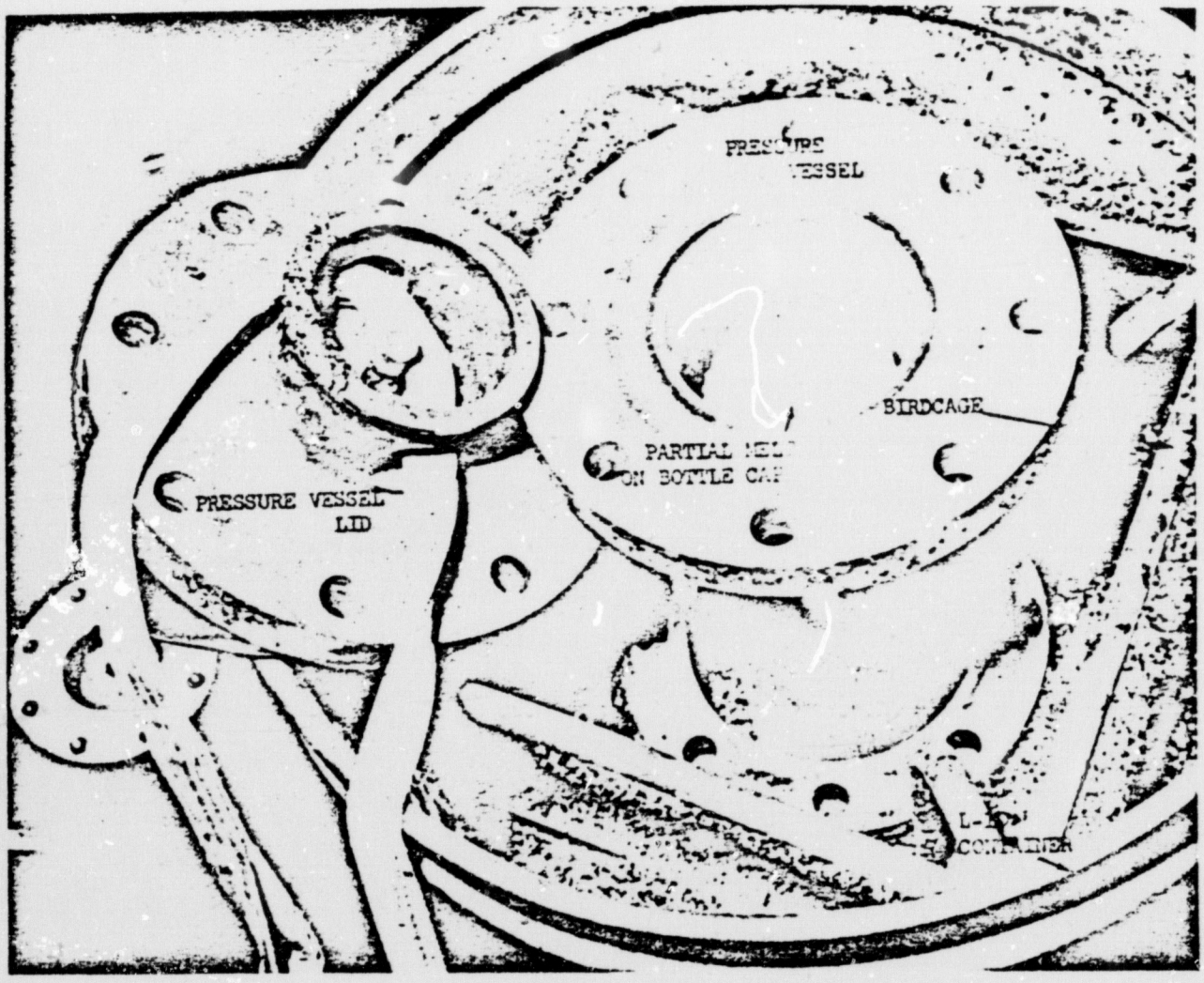


Figure 30. L-10 Container Post Fire Test

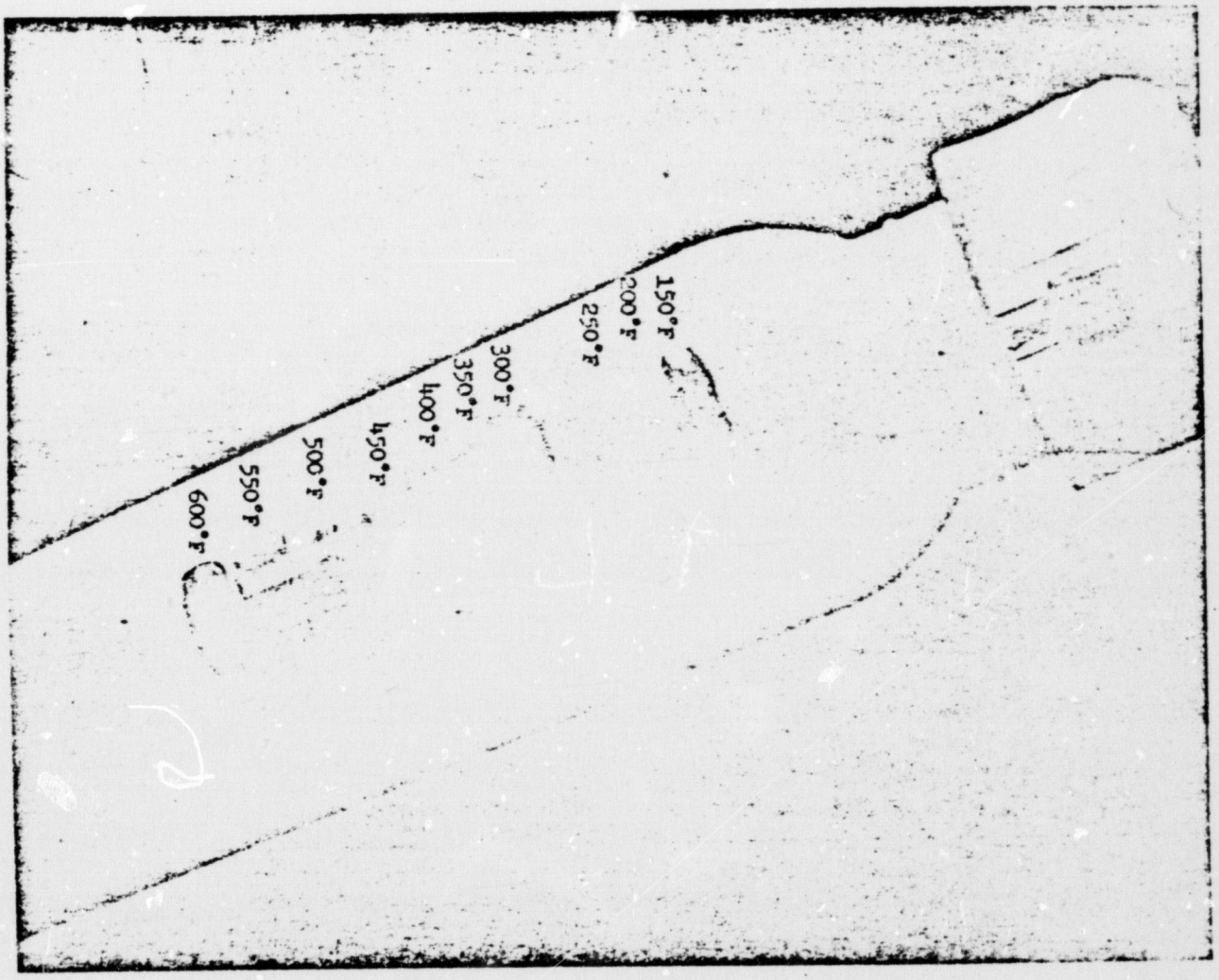


Figure 31. L-10 Polyethylene Bottle Post Fire Test



Figure 32. Typical Test Stand Impression Left in all Containers

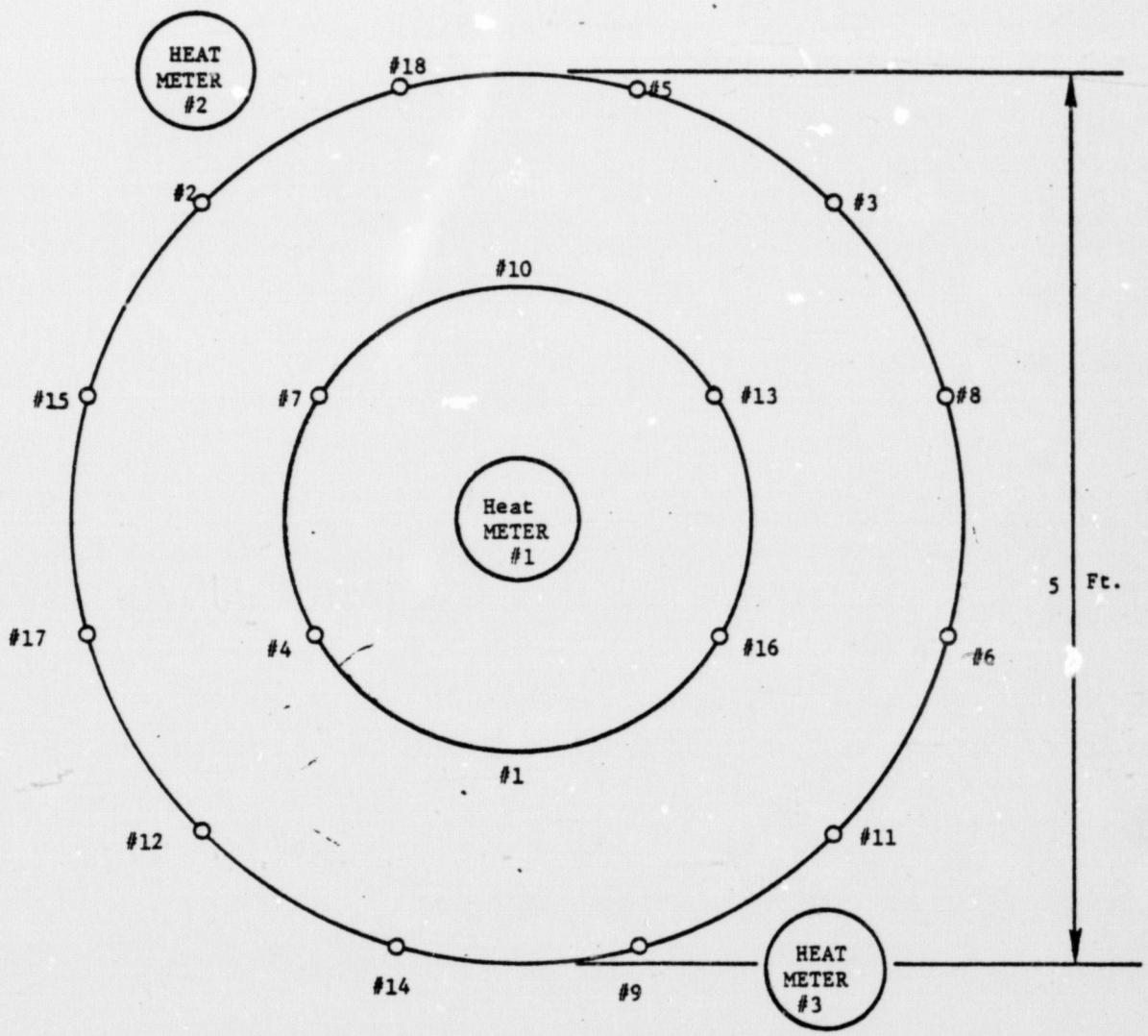


Figure 33. Thermocouple Array Used in Experimental Fire Test

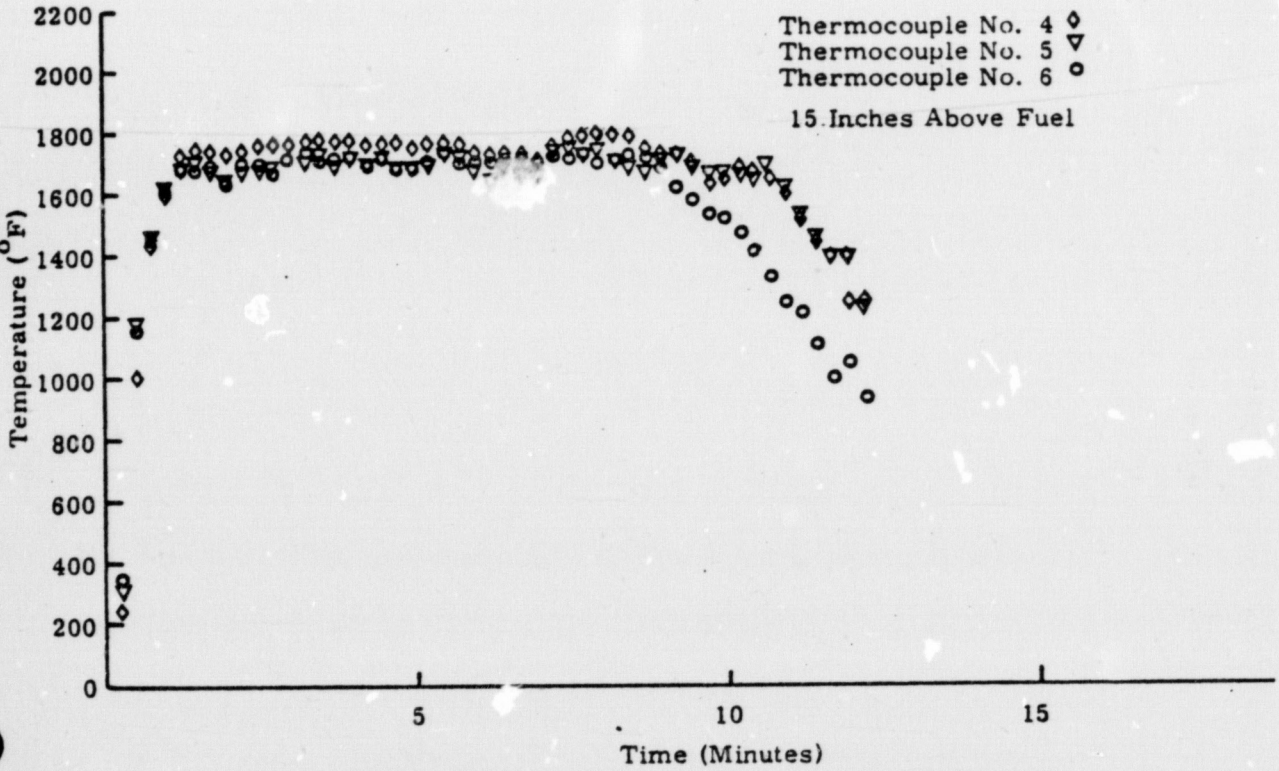


Figure 34. Experimental Fire Test Typical Thermocouple Readings

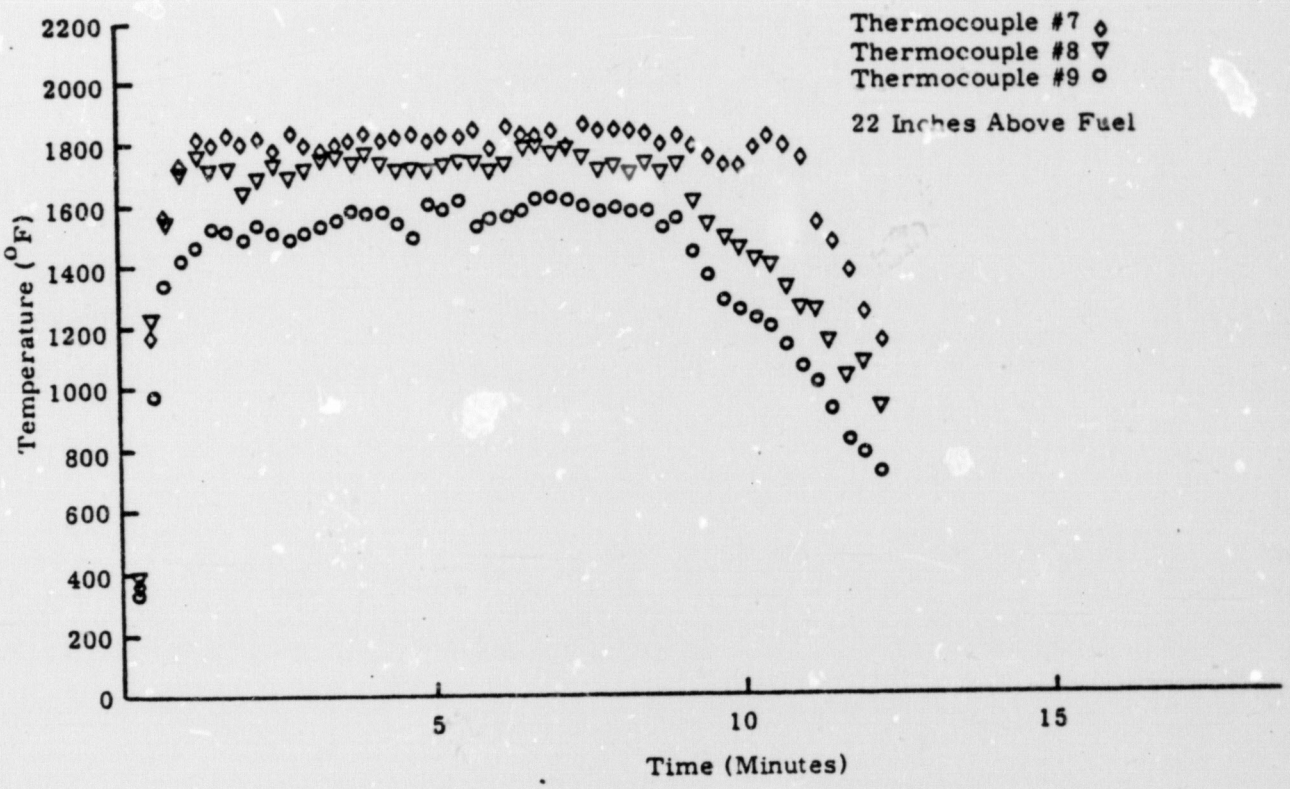


Figure 35. Experimental Fire Test Typical Thermocouple Readings

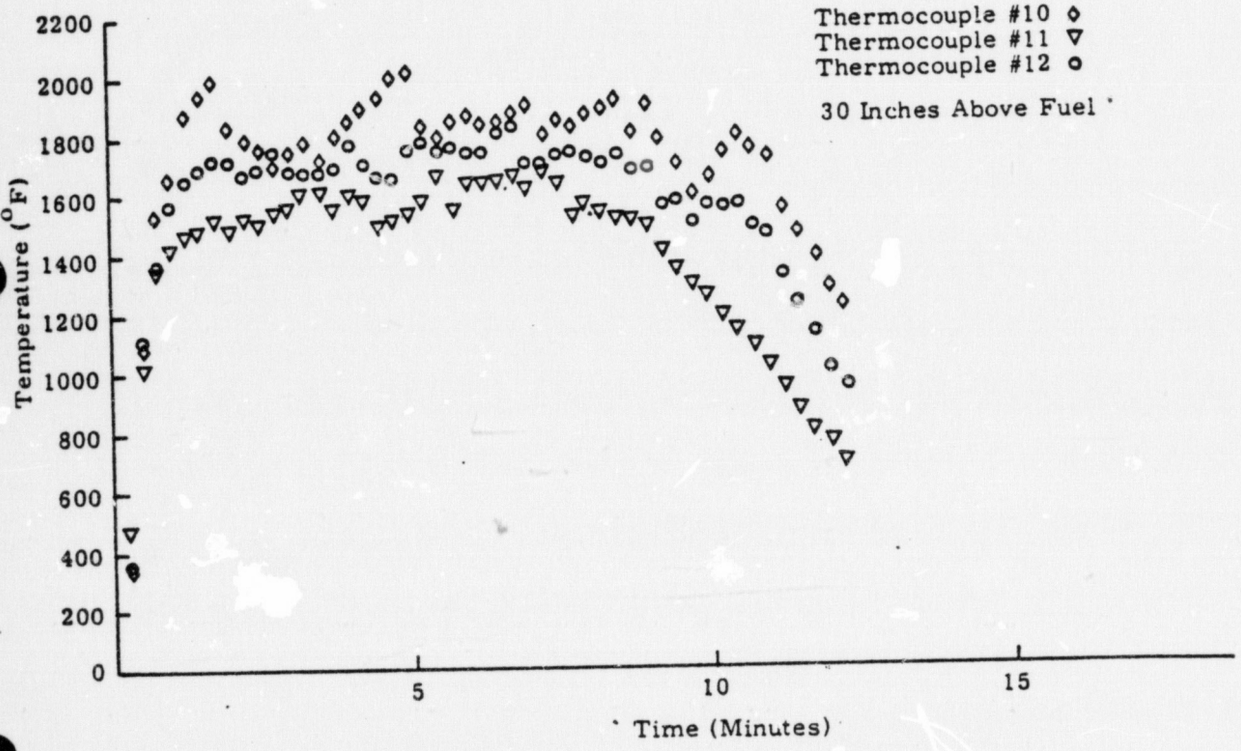


Figure 36. Experimental Fire Test Typical Thermocouple Readings

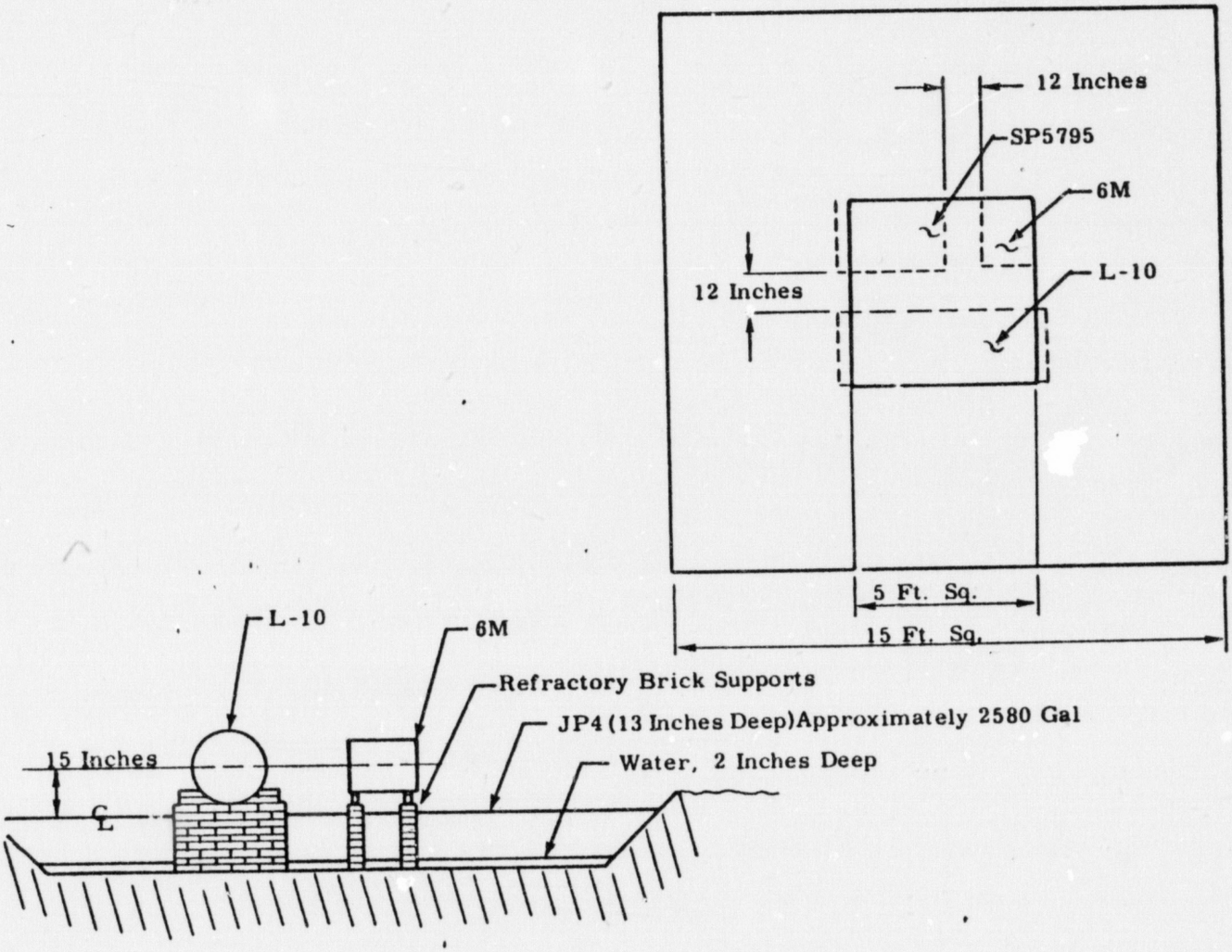


Figure 37. Fire Test Setup

APPENDIX A

DOT SPECIAL PERMIT NO. 5795

DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

SPECIAL PERMIT NO. 5795
SIXTH REVISION

Pursuant to 46 CFR 146.02-25 of the U. S. Coast Guard (USCG) Dangerous Cargo Regulations and 49 CFR 170.15 of the Department of Transportation (DOT) Hazardous Materials Regulations, as amended, and on the basis of the May 19, 1972 petition by Oak Ridge National Laboratory (Union Carbide Corporation), Oak Ridge, Tennessee.

Special Permit No. 5795 is hereby amended as follows:

1. Paragraph (1) is changed to require that shipments must be in accordance with the provisions of U. S. Atomic Energy Commission, Oak Ridge Operations Office Certificate of Approval No. 72-003, dated May 1, 1972, or other equivalent USAEC approval.

2. The existing appendix (Table of Authorized Contents) is revised and replaced by the appendix attached hereto. Changes involve loadings of U-233 solutions only.

All other terms of this permit, as revised, remain unchanged. The complete permit currently in effect consists of the Fourth, Fifth and Sixth Revisions.

Issued at Washington, D.C.:

R. G. Schwing, Capt.
For the Commandant
U. S. Coast Guard — 16 June 1972 (DATE)

For W. R. Fiste
For the Administrator
Federal Highway Administration — 22 JUN 1972 (DATE)

For Mac E. Rogers
For the Administrator
Federal Railroad Administration — 27 June 1972 (DATE)

Ellis C. Langford
For the Administrator
Federal Aviation Administration — (DATE)

Continuation of 6th Rev. SP 5795

Address all inquiries to: Secretary, Hazardous Materials Regulations Board, U. S. Department of Transportation, Washington, D.C. 20590. Attention: Special Permits.

Dist: a, b, c, d, e, h, i
U. S. Atomic Energy Commission, Richland, Washington
U. S. Atomic Energy Commission, New Brunswick, N.J.
Dow Chemical Company, Golden, Colorado
U. S. Atomic Energy Commission, Las Vegas, Nevada

APPENDIX

TABLE OF AUTHORIZED PACKAGE CONTENTS

Transport Index	Metal	UO_2 Oxide H:X $\leq$ 0.4	UO_2 Oxide H:X $\leq$ 3	Aqueous Solution (Any Concentration
		Uranium-235		
	(p = 18.76 g U/cm^3)	(p = 8.09 g U/cm^3)	(p = 4.48 g U/cm^3)	
0.1	17.2 kg	18.8 kg	15.4 kg	2.35 kg
0.2	19.5	24.1	18.4	-
0.3	20.8	28.2	20.4	-
0.5	23.0	33.8	23.0	-
1.0	25.6	43.7	27.4	-
2.0	28.8	56.1	32.8	-
		Plutonium-239		
	(p - 19.7 g Pu/cm^3)	(p = 8.73 g Pu/cm^3)	(p = 4.71 g Pu/cm^3)	
0.1	5.3 kg	10.5 kg	9.2 kg	2.35 kg
0 2	5.6	11.6	10.7	-
0.3	5.8	12.4	11.8	-
0.5	6.2	13.5	13.3	-
1.0	6.5	14.9	15.6	-
2.0	7.0	16.5	18.3	-
		Uranium-233		
	(p = 18.4 g U/cm^3)	(p = 8.08 g U/cm^3)	(p = 4.46 g U/cm^3)	
0.1	7.5 kg	11.1 kg	8.3 kg	1.35 kg
0.2	8.0	12.6	10.1	1.76
0.3	8.3	13.7	11.5	2.00
0.5	8.8	15.0	13.3	2.35
1.0	9.2	17.1	16.2	--
2.0	9.9	19.3	19.8	--

DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

SPECIAL PERMIT NO. 5795
FIFTH REVISION

Pursuant to 46 CFR 146.02-25 of the U.S. Coast Guard (USCG) Dangerous Cargo Regulations and 49 CFR 170.15 of the Department of Transportation (DOT) Hazardous Materials Regulations, as amended, and on the basis of the November 5, 1971, petition by Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Special Permit No. 5795 is hereby amended as follows:

1. In paragraph (4), the 30 day limit on use of polyethylene bottles which have also been used as a storage vessel for nitrate solutions is hereby increased to 90 days.

2. In paragraph (7b), the last sentence, relating to unilateral approval, is hereby deleted.

3. Paragraph (10a) is added to read as follows:

"10a. For shipments by air, a copy of this permit, kept current, must be carried aboard each aircraft transporting radioactive material under these terms."

4. Paragraph (16) is amended to read as follows:

"16. This permit expires on January 31, 1974."

All other terms of this permit, as revised, remain unchanged. The complete permit currently in effect consists of the Fourth and Fifth Revisions.

Continuation of 5th Rev. SP 5795

Issued at Washington, D.C.:

R.G. Schwing, Capt.
For the Commandant
U.S. Coast Guard

6 December 1971
(DATE)

for W.R. Fiste
For the Administrator
Federal Highway Administration

8 DEC 1971
(DATE)

Mac E. Rogers
For the Administrator
Federal Railroad Administration

DEC 15 1971
(DATE)

Ellis C. Langford
For the Administrator
Federal Aviation Administration

17 DEC 1971
(DATE)

Address all inquiries to: Secretary, Hazardous Materials Regulations Board, U.S. Department of Transportation, Washington, D.C. 20590. Attention: Special Permits.

Dist: a, b, c, d, e, h, i
U.S. Atomic Energy Commission, New Brunswick, New Jersey
U.S. Atomic Energy Commission, Las Vegas, Nevada
The Dow Chemical Company, Golden, Colorado
U.S. Atomic Energy Commission, Richland, Washington

DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

FOURTH REVISED SPECIAL PERMIT NO. 5795
(COMPLETE REVISION)

This special permit is reissued pursuant to 46 CFR 146.02-25 of the U. S. Coast Guard (USCG) Dangerous Cargo Regulations and 49 CFR 170.15 of the Department of Transportation (DOT) Hazardous Materials Regulations, as amended, and on the basis of the December 5, 1969, petition by Oak Ridge National Laboratory, Oak Ridge, Tennessee.

1. Shipments of large quantities of fissile radioactive materials, n.o.s., are hereby authorized in the packaging as described in this special permit. This packaging, when constructed and assembled as prescribed herein, with the contents as authorized herein meets the standards prescribed in the DOT regulations, Sections 173.395(c)(2), 173.396(c)(3), and 173.398(c). Shipments must be in accordance with the provisions of the U. S. Atomic Energy Commission (USAEC), Oak Ridge Operations Office approval number 69-017 dated November 10, 1969, or other equivalent USAEC approvals, and as further provided for herein.

2. Each shipper, under this permit, other than the petitioner named above, and the previously identified petitioners: U. S. Atomic Energy Commission, New Brunswick, New Jersey and the U. S. Atomic Energy Commission, Richland, Washington, shall register his identity with this Board prior to his first shipment, and shall have a copy of this permit in his possession before making any shipment.

3. The packaging authorized by this permit consists of a metal, drum-type birdcage, which has a 55-gallon volume DOT Specification 17H, or equivalent, open-head steel outer drum, with bolted ring closure. The inner containment vessel, which is a flanged and gasketed closure DOT Specification 2R, of stainless steel, 18" long by 4.81" I.D., is centered and supported within the outer drum by means of a plywood disc and rigid foamglas insulation material (per USAEC Material Specification SP-9) which fills the entire void space between the inner and outer containers. The annular spacer between the inner container, drum, foamglas and plywood disc is filled with epoxy resin which also covers the foamglas piece in the void above the inner container. The tare and gross weights of the package are about 200 and 215 pounds respectively. Solids must be additionally contained in innermost sealed metal cans and liquids within polyethylene bottles, within the inner containment vessel. The package is identified as the Foamglas Shipping Container, and is described on Oak Ridge National Laboratory's drawing number 68-14352R1 and M-12166-CD-005-D (plastic bottle).

4. For shipment of nitrate solutions, no polyethylene bottle may be used which has also been used as a storage vessel for nitrate solutions for more than 30 days. Any internal pressure within the polyethylene bottle must have been relieved within 48 hours prior to shipment. An "O"-ring seal (Viton-Fluorelastomer, or approved equivalent) must be used as part of the cap closure. The cap must be subjected to at least 15 foot-pounds of torque during closure. Venting is authorized. Bottles must conform to the requirements of DOT Specification 34, except for §§178.19-2(b), 178.19-6, and 178.19-7(c)(2). The package is not authorized for nitrate solutions exceeding 6 molar. The package is exempted from the provisions of §173.268 of the DOT regulations.

5. The contents of each package authorized by this permit consist of large quantities of fissile radioactive material, n.o.s., as uranium-233, or plutonium-239, as solid metal or oxide or solution, either singly or in mixtures, as further limited in the Appendix hereto. The uranium may contain up to 100% U-233, U-235, or U-238. For quantities of plutonium exceeding 50 grams, the plutonium shall contain at least 60 w/o Pu-239, more Pu-240 than Pu-241, and Pu-238 will be considered part of the Pu-239. The maximum thermal decay energy of the contents shall not exceed either 10 watts (for solids) or 5 watts (for liquids).

6. The authorized packaging meets the requirements for shipment as Fissile Class II, with the applicable transport indices as prescribed in the Appendix hereto, to be assigned to each package (unless, however, external radiation levels dictate a higher assignment).

7. The authorized package described herein is hereby certified as meeting the specific requirements of the International Atomic Energy Agency's (IAEA) "Regulations for the Safe Transport of Radioactive Material", Safety Series No. 6, 1967 edition, as follows:

a. Marginal C-6.2.2 - The package design meets the requirements for Type B packaging for radioactive materials.

b. Marginal C-6.2.3 - The package design meets the requirements for Type B packaging for large quantity (source) radioactive materials. Specifically, the packaging design meets the requirements of Marginal C-6.2.3.1(a) for unilateral approval.

c. Marginal C-6.2.4 - The package design meets the requirements for Fissile Class II, shipments.

d. Marginal C-2.4.3 - The packaging design is based on the ambient conditions.

e. Marginal C-6.5 - No special transport controls are necessary during carriage and no special arrangements have been prescribed, except as specified herein.

8. The outside of each package must be plainly and durably marked "USA DOT SP 5795" and "TYPE B", in connection with and in addition to the other markings and labels prescribed by the DOT regulations. Each shipping paper issued in connection with shipments made under this permit must bear the notation "DOT SPECIAL PERMIT NO. 5795", in connection with the commodity description thereon.

9. Each package must have its gross weight plainly and durably marked on the outside of the package.

10. This permit authorizes shipments by vessel, passenger-carrying aircraft, cargo-only aircraft, motor vehicle, and rail.

11. For shipments by water:

a. A copy of this permit must be carried aboard any vessel transporting radioactive material under these terms.

b. The shipper or agent shall notify the USCG Captain of the Port in the port area through which the shipment is to be made, and of the time, date, and place of loading or unloading. When the initial notification is given in a port area, it must be accompanied by a copy of this permit, addressed to the attention of that Captain of the Port.

12. The shipper is required to furnish an experience report to this Board before expiration of the permit and when any amendment is requested. This report must include the approximate number of packages shipped, and the number of packages involved in any loss of contents. The modes of transportation used for these shipments must also be shown.

Continuation of 4th Rev SP 5795

13. Prior to each shipment authorized by this permit, the shipper shall notify the consignee and, for export shipments, the competent authority of any country into or through which the package will pass, of the dates of shipment and expected arrival.

14. Any incident involving loss of contents of the package must be reported to this Board at the earliest feasible moment following the incident.

15. This permit does not relieve the shipper or carrier from compliance with any requirement of either the DOT regulations, including 46 CFR 146 to 149 of the USCG Regulations, except as specifically provided for herein, or the regulations of any foreign government into or through which the package will be carried.

16. This permit expires January 31, 1972, and may be revoked for cause at any time.

Issued at Washington, D.C.:

E. G. Grundy, Capt.
For the Commandant
U. S. Coast Guard

4 February 1970
(Date)

S. Schneider
For the Administrator
Federal Aviation Administration

19 MAR 1970
(Date)

W. R. Fiste
For the Administrator
Federal Highway Administration

1-28-70
(Date)

Mac E. Rogers
For the Administrator
Federal Railroad Administration

JAN 30 1970
(Date)

Continuation of 4th Rev SP 5795

Address all inquiries to: Secretary, Hazardous Materials Regulations Board, U.S. Department of Transportation, Washington, D.C. 20950. Attention: Special Permits.

Dist: a, b, c, d, e, h, i
U. S. Atomic Energy Commission, New Brunswick, N.J.
U. S. Atomic Energy Commission, Richland, Washington

APPENDIX

TABLE OF AUTHORIZED PACKAGE CONTENTS

Transport Index	Metal	UO_2 Oxide H:X ≤ 0.4	UO_2 Oxide H:X ≤ 3	Aqueous Solution (Any Concentration
		Uranium-235		
	(ρ = 18.76 g U/cm^3)	(ρ = 8.09 g U/cm^3)	(ρ = 4.83 g U/cm^3)	
0.1	17.2 kg	18.8 kg	15.4 kg	2.35 kg
0.2	19.5	24.1	18.4	-
0.3	20.8	28.2	20.4	-
0.5	23.0	33.8	23.0	-
1.0	25.6	43.7	27.4	-
2.0	28.8	56.1	32.8	-
		Plutonium-239		
	(ρ = 19.7 g Pu/cm^3)	(ρ = 8.73 g Pu/cm^3)	(ρ = 4.71 g Pu/cm^3)	
0.1	5.3 kg	10.5 kg	9.2 kg	2.35 kg
0.2	5.6	11.6	10.7	-
0.3	5.8	12.4	11.8	-
0.5	6.2	13.5	13.3	-
1.0	6.5	14.9	15.6	-
2.0	7.0	16.5	18.3	-
		Uranium-233		
	(ρ = 18.4 g U/cm^3)	(ρ = 8.08 g U/cm^3)	(ρ = 4.46 g U/cm^3)	
0.1	7.5 kg	11.1 kg	8.3 kg	1.58 kg [a]
0.2	8.0	12.6	10.1	2.06
0.3	8.3	13.7	11.5	2.35
0.5	8.8	15.0	13.3	-
1.0	9.2	17.1	16.2	-
2.0	9.9	19.3	19.8	-

[a] A request is being processed to revise the three ^{233}U solution limits to 85% of their currently approved value.

APPENDIX B

DOT SPECIAL PERMIT NO. 5061

DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

SPECIAL PERMIT NO. 5061
FIFTEENTH REVISION

Pursuant to 46 CFR 146.02-25 of the U. S. Coast Guard (USCG) Dangerous Cargo Regulations and 49 CFR 170.15 of the Department of Transportation (DOT) Hazardous Materials Regulations, as amended, and on the basis of the May 24, 1972 petition by Aerojet Nuclear Company, Idaho Falls, Idaho.

Special Permit No. 5061 is hereby amended as follows:

1. Paragraphs 1(d) and 5(d) are added to read:

"1(d). For the contents as limited by paragraph 5(d) - Idaho Operations Office approval dated May 19, 1972.

"5(d) Uranyl nitrate, plutonium nitrate, or neptunium nitrate, or any mixture thereof limited to not more than 10.5 liters, wherein the total concentration of uranium, plutonium, and neptunium does not exceed 250 grams per liter."

2. Paragraph 6 is changed by the addition of a fourth listing for Fissile Class II transport index assignment, as follows:

"Paragraph 5d contents - 1.5."

All other terms of this permit, as revised, remain unchanged. The complete permit currently in effect consists of the Thirteenth, Fourteenth, and Fifteenth Revisions.

Issued at Washington, D. C.:

Continuation of 15th Rev. SP 5061

for B.P. Milster — 16 JUN 1972

W. R. Fiste (DATE)
For the Administrator
Federal Highway Administration

Mac E. Rogers — JUN 20 1972

Mac E. Rogers (DATE)
For the Administrator
Federal Railroad Administration

Ellis C. Langford — 20 June 1972

Ellis C. Langford (DATE)
For the Administrator
Federal Aviation Administration

R. G. Schwing — 12 June 1972

R. G. Schwing (DATE)
For the Commandant
U. S. Coast Guard

Address all inquiries to: Secretary, Hazardous Materials Regulations Board, U. S. Department of Transportation, Washington, D. C. 20590
Attention: Special Permits.

Dist: a, b, c, d, e, h, i

Nuclear Fuel Services, Incorporated, West Valley, New York
The Dow Chemical Company, Golden, Colorado
Idaho Nuclear Corporation, Idaho Falls, Idaho
Kerr-McGee Corporation, Oklahoma City, Oklahoma
Nuclear Materials & Equipment Corporation, Apollo, Pennsylvania
U. S. Atomic Energy Commission, Richland, Washington
North American Rockwell Corporation, Canoga Park, California
N. Y. State Atomic & Space Development Authority, New York, New York
Consolidated Edison Co. of New York, Incorporated, New York, New York
Argonne National Laboratory, Argonne, Illinois
Edlow International, Washington, D.C.

DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

SPECIAL PERMIT NO. 5061
FOURTEENTH REVISION

Pursuant to 46 CFR 146.02-25 of the U.S. Coast Guard (USCG) Dangerous Cargo Regulations and 49 CFR 170.15 of the Department of Transportation (DOT) Hazardous Materials Regulations, as amended, Special Permit No. 5061 is hereby amended as follows:

1. Paragraph (1a) is amended to read as follows:

"1. * * *

a. For contents as limited by paragraph 5(a) - USAEC license SNM-984 (71-11), dated November 11, 1969, or USAEC license SNM-1138 (71-1), dated May 26, 1969, as amended April 15 and May 7, 1971; or USAEC, Richland Operations Office approval dated October 18, 1966."

2. In paragraph (3), the last two sentences are changed to read,

"This version of the package is identified as the Model ASDA-10LI. The provisions of paragraph (4), except for the exemption from the provisions of §173.268 of the Department of Transportation Regulations, do not apply to this version."

3. In paragraph (4), line 3, "30 days" is changed to read "90 days."

All other terms of this permit, as revised, remain unchanged. The complete permit currently in effect consists of the Thirteenth and Fourteenth Revisions.

Continuation of 14th Rev. SP 5061

Issued at Washington, D.C.:

R.G. Schwing, Capt.
For the Commandant
U.S. Coast Guard

6 December 1971
(DATE)

for B.G. Milstead

W.R. Fiste
For the Administrator
Federal Highway Administration

8 DEC 1971
(DATE)

Mac E. Rogers
For the Administrator
Federal Railroad Administration

DEC 15 1971
(DATE)

Ellis C. Langford
For the Administrator
Federal Aviation Administration

DEC 1971
(DATE)

Address all inquiries to: Secretary, Hazardous Materials Regulations Board, U.S. Department of Transportation, Washington, D.C. 20590. Attention: Special Permits.

Dist: a, b, c, d, e, h, i
Nuclear Fuel Services, Incorporated, West Valley, New York
The Dow Chemical Company, Golden, Colorado
Idaho Nuclear Corporation, Idaho Falls, Idaho
Kerr-McGee Corporation, Oklahoma City, Oklahoma
Nuclear Materials & Equipment Corporation, Apollo, Pennsylvania
U.S. Atomic Energy Commission, Richland, Washington
North American Rockwell Corporation, Canoga Park, California
N.Y. State Atomic & Space Development Authority, New York, New York
Consolidated Edison Co. of New York, Incorporated, New York, New York
Argonne National Laboratory, Argonne, Illinois

DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

SPECIAL PERMIT NO. 5061
THIRTEENTH REVISION
(COMPLETE)

This special permit is reissued pursuant to 46 CFR 146.02-25 of the U.S. Coast Guard (USCG) Dangerous Cargo Regulations and 49 CFR 170.15 of the Department of Transportation (DOT) Hazardous Materials Regulations, as amended, and on the basis of the March 22, 1971, petition by Nuclear Fuel Services, Inc., West Valley, New York; and the previous petitions on file with this Board.

1. Shipments of large quantities of fissile radioactive materials, n.o.s., are hereby authorized in the packaging as described in this special permit. This packaging, when constructed and assembled as prescribed herein, with the contents as authorized herein meets the standards prescribed in the DOT regulations, Sections 173.395(c)(2), 173.396(c)(3) and 173.398(c). Shipments must be in accordance with the provisions of either of the following USAEC approvals, or equivalent approvals thereto:

a. For contents as limited by paragraph 5a--USAEC license SNM-984 (71-10) dated September 22, 1969, or USAEC license SNM-1138, (71-1) dated May 26, 1969; or USAEC, Richland Operations Office approval dated October 18, 1966.

b. For contents as limited by paragraph 5b--USAEC, Richland Operations Office approval dated March 7, 1967.

c. For contents as limited by paragraph 5c--USAEC, San Francisco Operations Office approval dated June 8, 1969.

2. Each shipper, under this permit, other than the petitioner named above, and the other petitioners previously identified by this Board, shall register his identity with this Board prior to his first shipment, and shall have a copy of this permit in his possession before making any shipment.

3. The packaging authorized by this permit consists of a nominal 12-liter polyethylene bottle, contained in a 5-inch inside diameter stainless steel pressure vessel, with flanged, bolted closure. The pressure vessel is centered and supported by a welded tubular steel structure, insulated with vermiculite, within an overpack of welded double-high, 55 gallon drums which are equivalent to DOT Specification 6J or 17H. The outer container closure shall conform to §178.103-5. The package is identified as the Dow L-10 or NFS-10 LI Type. The NFS-10 LI package is described on NFS Drawings No. CAPE-1170-15, 35, 36, and 37. As an alternate gasket material for the pressure vessel closure,

a flat gasket of fluorelastomer (Viton "A") as described in Atlantic Richfield Hanford Company's drawing number SK-2-21001, may be used in lieu of the gas-filled stainless-steel "O" ring gasket. As an alternate, the product containers may be a stainless steel capsule, as prescribed in paragraph 5a, 3, and 7 of USAEC license SNM-1138 (71-1). This version of the package is identified as the Model ASDM-10 LI. The provisions of paragraph (4) do not apply to this version.

4. For shipment of nitrate solutions, no polyethylene bottle may be used which has also been used as a storage vessel for nitrate solutions for more than 30 days. Any internal pressure within the polyethylene bottle must have been relieved within 48 hours prior to shipment. An "O"-ring seal (Viton-Fluorelastomer, or approved equivalent) must be used as part of the cap closure. The cap must be subjected to at least 15 foot-pounds of torque during closure. Venting is authorized. Bottles must conform to the requirements of DOT Specification 34, except for §§178.19-2(b), 178.19-6, and 178.19-7(c)(2). The package is not authorized for nitrate solutions exceeding 6 molar. The package is exempted from the provisions of §173.268 of the DOT regulations.

5. The contents of each package authorized by this permit consist of fissile radioactive material, including large quantities, as either of the following:

a. Uranyl nitrate or plutonium nitrate solutions, limited to not more than 10.5 liters of either of the following:

1. Uranyl nitrate solutions having a concentration of Uranium-235 not exceeding 350 grams per liter and an H/U-235 atomic ratio not less than 80, provided that the combined U-233 and plutonium content is not more than 1% of the U-235 content; or

2. Uranyl nitrate solution having a combined concentration of Uranium-233 and Uranium-235 not exceeding 250 grams per liter and a hydrogen/fissile material atomic ratio not less than 80, provided (1) that the U-233 content is not greater than 20 per cent of the combined U-233 and U-235 content and (2) that the plutonium content is not more than one per cent of the combined U-233 and U-235 content; or

3. Plutonium nitrate solutions having a concentration not exceeding 250 grams of Pu-239 per liter.

b. Not more than 4.5 Kilograms of dry plutonium-uranium compounds and mixtures.

c. Not more than 450 grams of Uranium-235 in the form of 93.137% U-235 enriched uranyl sulfate solution (UO_2SO_4).

6. The packaging authorized by this permit meets the requirements for shipment as Fissile Class II with the transport indices as follows to be assigned to each package (unless, however, external radiation levels dictate a higher assignment):

Paragraph 5a contents - 1.5

Paragraph 5b contents - 0.5

Paragraph 5c contents - 1.5.

7. The packaging authorized by this permit with the contents as limited by paragraph 5(a) meets the requirements for shipment as Fissile Class III, with not more than 68 packages per transport vehicle or stowage area. Shipments by cargo-only aircraft must conform to §173.396(g)(1).

8. The authorized package described herein is hereby certified as meeting the specific requirements of the International Atomic Energy Agency's (IAEA) "Regulations for the Safe Transport of Radioactive Material," Safety Series No. 6, 1967 edition, as follows:

a. Marginal C-6.2.3 - The package design meets the requirements for Type B packaging for large quantity (source) radioactive materials.

b. Marginal C-6.2.4 - The package design meets the requirements for Fissile Class II and III shipments.

c. Marginal C-2.4.3 - The packaging design is based on the ambient conditions.

d. Marginal C-6.5 - No special transport controls are necessary during carriage and no special arrangements have been prescribed, except as specified herein.

9. The outside of each package must be plainly and durable marked "USA DOT SP 5061" and "TYPE B", in connection with and in addition to the other markings and labels prescribed by the DOT regulations. Each shipping paper issued in connection with shipments made under this permit must bear the notation "DOT SPECIAL PERMIT NO. 5061", in connection with the commodity description thereon.

10. Each package must have its gross weight plainly and durably marked on the outside of the package.

11. This permit authorizes shipments only by vessel, cargo-only aircraft, motor vehicle and rail.

12. For shipments by water or air, a copy of this permit, kept current, must be carried aboard any vessel or aircraft transporting radioactive material under these terms.

Continuation of 13th Rev. SP 5061

13. For shipments by water:

The shipper or agent shall notify the USCG Captain of the Port in the port area through which the shipment is to be made, of the name of the vessel on which the shipment is to be made, and of the time, date, and place of loading or unloading. When the initial notification is given in a port area, it must be accompanied by a copy of this permit, addressed to the attention of that Captain of the Port.

14. Prior to each shipment authorized by this permit, the shipper shall notify the consignee and, for export shipments, the competent authority of any country into or through which the package will pass, of the dates of shipment and expected arrival.

15. Any incident involving loss of contents of the package must be reported to this Board at the earliest feasible moment.

16. The permit does not relieve the shipper or carrier from compliance with any requirement of either the DOT regulations, including 46 CFR Parts 146 to 149 of the USCG regulations, except as specifically provided for herein, or the regulations of any foreign government into or through which the package will be carried.

17. This permit expires on June 30, 1973.

Issued at Washington, D.C.:

R.G. Schwing, Capt.
For the Commandant
U.S. Coast Guard

17 MAY 1971
(DATE)

for W.R. Fiste
For the Administrator
Federal Highway Administration

14 MAY 1971
(DATE)

Mac E. Rogers
For the Administrator
Federal Railroad Administration

MAY 18 1971
(DATE)

S. Schneider
For the Administrator
Federal Aviation Administration

25 MAY 1971
(DATE)

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

----------x

THE STATE OF NEW YORK, :

Plaintiff, : 75 Civ. 2121 (WCC)

-v- :

THE NUCLEAR REGULATORY COMMISSION, et al., :

Defendants. :

----------x

SECTION TWO OF AFFIDAVITS IN OPPOSITION TO PLAINTIFF'S MOTION FOR A PRELIMINARY INJUNCTION

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,

Plaintiff,

v.

THE NUCLEAR REGULATORY COMMISSION, et al.,

Defendants.

AFFIDAVIT

75 Civ. 2121 (WCC)

MONTGOMERY COUNTY)
: SS.:
STATE OF MARYLAND)

ROBERT F. BARKER, being sworn, deposes and says:

1. I am a health physicist and Chief of the Transportation and Products Standards Branch, Office of Standards Development, of the United States Nuclear Regulatory Commission ("NRC"). I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction.

2. I have been employed by the NRC, and its predecessor agency, the AEC, since 1955, except for a two-year period when I served with the International Atomic Energy Agency. I have held my current position since 1961. By virtue of my education, experience and responsibilities, I am qualified as an expert with respect to the hazardous properties of special nuclear materials and the manner in which such materials might be dispersed in the atmosphere in the event of container failure in an aircraft accident. A summary of my professional qualification is attached hereto as Exhibit A.

3. I have carefully reviewed the complaint, motions for temporary restraining order and preliminary injunction and supporting affidavits concerning the alleged risks of air transportation of special nuclear material filed by the plaintiff in this action, particularly those portions pertaining to the hazardous properties of plutonium and the alleged consequences of container failure.

This affidavit and supporting exhibits set forth the basis for my judgment that, in the event of failure of a container of plutonium in an aircraft accident, the risk that substantial amounts of plutonium would be released to the atmosphere is very small, and, even if that were to happen, the risk that significant numbers of people would be seriously injured or killed is also very small.

4. The hazardous properties of special nuclear material depend upon the type of material, the form it is in, and the amount.

5. Special nuclear material may be converted into and shipped in various forms. Enriched uranium and plutonium may be shipped as a metal, a liquid (nitrate form) or as a particulate (oxide form). Enriched uranium may also be shipped in a fluoride form, a waxy type substance which, if released to the air, would form a white vapor. The particulate forms of uranium oxide and plutonium oxide are similar in composition to very fine metal filings. The metal form of either uranium or plutonium would look much like a pellet or rod of any other metal.

6. Like other industrial materials, special nuclear material is shipped in a form compatible with the use for which is is designed. The nitrate and oxide forms are the most convenient and usual forms which have evolved in the industry.

7. The hazardous properties of special nuclear material, other than irradiated nuclear fuel, are significant only if the material is ingested or inhaled into the body. The radiation given off by these materials is of low penetrating power so that it is easily shielded by transportation packaging, and would produce only minor effects to small exposed portions of a person's skin if the shielding were lost in transportation. The radiation associated with irradiated nuclear fuel does present a

serious external radiation hazard and thus requires heavy shielding. However, the weight of these irradiated fuel shipments, due to the heavy shielding, makes air transportation practically impossible.

8. Since unirradiated special nuclear materials present no significant radiation hazard outside of the body, it is only necessary to discuss enriched uranium and plutonium in particulate and liquid forms and enriched uranium in fluoride form. It is also unnecessary to discuss uranium 233 which is produced by irradiation of thorium since it only exists in experimental quantities at this time.

9. In determining the consequences of the release of special nuclear materials from a container due to an aircraft accident, or from any other transportation accident, one must consider a number of interrelated factors, the principal ones of which are:

i. Type of special nuclear material involved - special nuclear materials differ widely in degrees of hazardous properties.

ii. Form of the special nuclear material - as noted above, the radiations emitted by all unirradiated special nuclear materials are of low penetrating power and therefore only present significant hazards if they are in inhalable or ingestable forms.

iii. Particle size - if the material is in a particulate form, what portion of the material could be inhaled into the lung.

iv. Release - amount of special nuclear material spilled from the failed container.

v. Dispersal - the portion of the material released which may be taken up in the air.

vi. Diffusion - distribution patterns of the special nuclear material in different parts of affected air masses due to weather conditions.

vii. Exposure - the number of persons who may have inhaled or ingested the special nuclear material and the amount so inhaled or ingested.

Uranium

10. While low enriched uranium is usually not shipped in a particulate form, release of such uranium in a particulate form from a container presents no significant hazard because of its low specific radiological activity. Low enriched uranium is only slightly more radioactive than uranium in its natural form which may be safely handled like many other metals.

11. The amount of low enriched uranium oxide which one would have to inhale or ingest before there would be any damage to the body is so large that it is practically impossible to ingest such an amount under the short-term exposure conditions which might exist in the most extreme type of accident involving any mode of transportation. To inhale that amount, one would have to be in a literally "dusty" atmosphere consisting of a high and visible concentration of low enriched uranium particles suspended in the air all around one for several hours.

12. Such conditions of high concentrations of low enriched uranium suspended in the air are inconceivable in a transportation accident because (1) if the particles were released at ground level, most would stay on the ground and not be dispersed except under unusual conditions; and (2) even if the material

were dispersed into the air, it is inconceivable that the particles would remain suspended in one area for several hours in heavy concentrations.

13. Similarly, highly enriched uranium in an oxide form presents no significant hazard if released. While its radioactivity level is greater than that of low enriched uranium and the inhalation of a lesser amount could cause demonstrable damage to the body, one would still have to be in a concentrated "dusty" atmosphere of highly enriched uranium particles for approximately half an hour before one would have inhaled an amount sufficient to produce damage. Again it is inconceivable that this condition would be created by a transportation accident.

14. The liquid forms of both low and high enriched uranium present even less of a hazard for they are not readily ingestable or dispersable. The liquid would likely be absorbed into the ground or, if vapors containing the uranium were released into the air, they would, as in the case of uranium oxide, have to produce a heavy concentration in the atmosphere for many hours before inhalation of sufficient amounts to cause any demonstrable damage could result.

15. If low or high enriched uranium in fluoride form were released from a container and mixed with the air, the fluoride would form a white vapor which would burn a person so that he would move away before he breathed any significant amount of the vapor. Thus the danger here of injury would be from the fluoride and not from the uranium.

Plutonium

16. The radiological, biological, physical and chemical properties of plutonium have been the subject of continuing research for more than 30 years by many scientists. An extensive body of information on that subject now exists.

17. Because of its low penetrating radiation, plutonium is not a significant hazard unless it is taken into the body. The most likely routes of intake into the body are: (a) deposition in the lung via inhalation, and absorption into body fluids from the lung; (b) absorption through the skin or entry through wounds; and (c) ingestion and subsequent absorption from the GI tract.

18. Both the research evidence and experience in working with plutonium have shown that the possibility of absorption of a significant amount of plutonium into the body through the skin is negligible, even through scratches, cuts and abrasions. Plutonium in deep cuts and punctures is not readily absorbed, but remains at the wound site and can be removed surgically.

19. Extensive study with experimental animals of plutonium absorption from the GI tract supports the conclusion that ingestion of plutonium oxide is unlikely to present a hazard of any significant consequence. The average amount of absorption and retention is low (probably less than 0.003% of the amount ingested) and the alpha particles emitted by the plutonium are unlikely to penetrate the fluid layer between the contents of the intestine and the intestine wall. These two factors make negligible the possibility of ingesting sufficiently large amounts of plutonium oxide to cause damaging effects.

20. The principal hazard associated with the inhalation of plutonium is from the portion of the inhaled plutonium (approximately 15%) that may be deposited in the deep portions of the lung where it can remain for a significant period of time irradiating lung tissue and where portions can be transferred to the blood stream.

21. The minimum dosage required before there is any chance of significant injury depends upon the type of plutonium inhaled.

Since the most typical type of plutonium transported by air, so-called reactor plutonium, is also much more radiotoxic than plutonium-239 by itself, I will only discuss that type.

22. As a result of working with reactor plutonium, a number of people have accumulated quantities of it in their bodies. The amount accumulated is estimated by assessing the amount excreted in the urine. In order to monitor effects of this kind of exposure, 12 persons having 23 and 24 years exposure time have been kept under surveillance and given occasional medical examination. These people have shown no physical changes not attributable to the natural aging process.

23. Where inhalation of plutonium is known to have occurred, medical treatment such as lung lavage (flushing with water) and administration of DTPA (diethylene triamine pentaacetic acid) can be used to remove some of the plutonium, and thereby reduce the dose.

24. Based upon conservative dose calculations, deposition of 0.01 micrograms of reactor plutonium in the lung might cause death within a 15- to 45-year period after inhalation in about two cases out of 10,000.[1/] The risk to life increases and the time required for onset of fatal damage decreases as the amount deposited increases. The probability of eventual death from this cause is calculated to be about 50% for a deposition of 49 micrograms and 99% for 260 micrograms.

25. Even in a "dusty" atmosphere consisting of a high and visible concentration of plutomium particles, it would take at least ten minutes for a person to inhale sufficient plutonium to

1/ Based on dose calculations using ICRP Committee II dose models and risk values from the BEIR Report.

cause death from radiation within a few days.[2/]

26. An evaluation of the potential effects of an accidental release of plutonium oxide from a failed container requires a complex analysis involving the several interrelated factors listed in paragraph 9 above. Apart from the extent of the container failure -- little or no material would escape from a cracked container -- some of the more important factors are (1) amount released; (2) dispersal -- how much of the plutonium released from the container would be taken up into the air; (3) diffusion -- what are the resulting concentrations of the dispersed material in the air; (4) particle size -- what portion of the dispersed material is present in a form which could be inhaled into the lung, and (5) exposure -- how many people will be exposed to the air containing the dispersed material and how much will be inhaled by each.

27. Dispersal. Most potential transportation accidents would result in conditions under which no significant dispersal of plutonium would occur. This would usually be the case, for example, in an accident involving impact into soil or water, where the container would be buried in the soil or would be under water.[3/] (The accompanying affidavit of Donald A. Nussbaumer at paragraph 13 cites a study showing that there is a 46% probability that an aircraft accident would occur in water or soft soil.)

2/ I am assuming a high concentration of 10 milligrams of plutonium per cubic meter of air which will result in deposition in the lung of about 260 micrograms.

3/ An impact and subsequent dispersion into water from a failed container could involve hazards of a different order (and different assumptions and calculations) than those involved in dispersions into the air. The hazards from dispersions in air are greater than water dispersions, because, among other reasons, plutonium oxide is not soluable in water and plutonium ingested in drinking water presents less serious health hazards than plutonium inhaled into the lungs. See paragraph 19 above.

28. Experts from many countries at the International Atomic Energy Agency have adopted the value of 0.1 of 1% for purposes of calculating amounts of liquid or solid radioactive materials which would be released from failed containers and dispersed in the atmosphere in transportation accidents, including aircraft accidents. This value is supported by studies made in the laboratory and of actual accident conditions where containers not designed to withstand accident conditions, unlike the containers used for shipping special nuclear material, failed. (Domanus - Tests on Transport Packaging for Radioactive Material, Proceedings of IAEA Seminar, Vienna, Austria, 1971; Sisler - Fourth International Symposium on Transportation of Radioactive Material, 1974).

29. These studies looked at two interrelated factors: the amount of material that would be released and the portion of that amount which would be dispersed. The amount of dispersal varies with the forces available for dispersion. For example, Cohen (University of Pittsburgh - March 1975) states that simply blowing air over particles is not an efficient method of dispersing the particles. Moreover, the particles tend to stick to things with which they came in contact, for example, grass, buildings or other things.

30. Plutonium particles have a low dispersal rate due to their relatively high density and their tendency to adhere to other surfaces. Although smaller than grains of sand, they are much heavier than would be a grain of sand of the same size. Thus, there is likely to be little dispersion of spilled plutonium because its "stickiness" and relatively heavy weight makes it not readily dispersable by normal air turbulence. Even if the container were involved in a fire, the condition which could produce the most significant dispersal, only a fraction of the plutonium

released from the container would be dispersed into the atmosphere.

31. In my judgment, then, and based upon the studies cited in paragraphs 28 and 29 above, the amount of plutonium particles likely to be released and dispersed in an aircraft accident causing container failure would not exceed a fraction of 1% of the contents of a single container except under the most unusual of circumstances.

32. Diffusion. The concentrations of plutonium in the air resulting from the dispersed material would depend on the height of the release, the size and weight of the particles, and on a number of meteorological conditions existing at the time and shortly after the accident, including wind speed and atmospheric stability, i.e., the amount of turbulence in the atmosphere.

33. Except in the case of a mid-air collision, the probability of which is extremely remote, causing a container failure, any container failure in an aircraft accident would occur on or near the ground. This factor would lessen the resulting hazard. Any released plutonium that is dispersed would be diluted by diffusion in the air in both a horizontal and vertical plane, i.e., parallel to the ground and in altitude above the ground.

34. The amount of dilution, and the size of the plume (i.e., the body of air containing the plutonium), would be a function of both distance from the point of release and existing atmospheric stability conditions. The more stable the atmospheric conditions, the greater the concentration of plutonium in the air and, conversely, the more turbulent the air the greater the diffusion and the lower the concentration of plutonium in air. Moreover, while stable atmospheric conditions are needed for less diffusion, the plutonium in that event would be less likely to be

dispersed due to its relatively heavy weight and adhesiveness.

35. The concentration of plutonium in the air would also be a function of the rate at which the dispersed plutonium settles out of the air and is deposited on the ground. The greater the rate of deposition, the lower the concentration of plutonium in the air at distances from the point of release. The rate of deposition of particulates is usually expressed in terms of the deposition velocity, i.e., the velocity at which the particles settle. Estimates of the deposition velocities for plutonium oxide range from 0.001 to 0.01 meters per second and are dependent on the size, weight, surface porosity of the particles and their tendency to agglomerate or adhere to other particles. Plutonium oxide dispersed in the air under accident conditions would be expected to be deposited with a relatively high deposition velocity -- between 0.003 and 0.01 meters per second. Rain would wash plutonium out of the air much faster.

36. The effect of diffusion is dramatically illustrated by the fact that approximately 5 tons, or about 5 million grams, of plutonium have been dispersed into the atmosphere through weapons testing. Yet, due to dilution, the amount of plutonium ingested by any one individual is negligible.

37. Particle Size. Particle size is a factor for two reasons. First, the particle must be small enough so that it may be inhaled into the lungs before significant damage to the body can occur. Normal plutonium oxide particles greater than about 10 microns in aerodynamic equivalent diameter will not be inhaled in the nose. Lesser size particles may be inhaled, but those above 3 microns will be trapped in the upper respiratory system and eliminated within a few days mainly by being expectorated or swallowed and expelled. Normal production of plutonium oxide produces particle sizes ranging up to 20 microns. Thus

shipments of plutonium may contain many particles which could not be inhaled into the nose or the lungs.

38. The second reason particle size is a factor is that the smaller the size of the particle, the less the radioactivity it will produce and therefore the less effect it will have if inhaled. This factor is important with respect to determining the amount of the exposure.

39. Exposure. Assuming dispersal of plutonium in a particle size which can be inhaled into the lungs, the number of persons who could be affected by the release depends upon the number of persons in the area to or over which the particles travel. Obviously, then, if the dispersed material is carried over a thinly populated area, less persons would be exposed than if it went to a heavily populated area. Another factor in determining exposure is the amount which may be inhaled. Again it is obvious that if a small amount is dispersed and is widely diffused then the amount any one person can inhale is that much less.

40. Based upon the number of interdependent conditions which must exist before there can be any significant harm due to the release of plutonium, it is my judgment that the probability of a release of plutonium oxide in an aircraft accident which would result in significant harm to significant numbers of persons is extremely remote.

41. In addition to the foregoing factors, various actions that are or would be taken to prevent and mitigate adverse consequences must also be considered in evaluating the risk or consequences of an accidental release of plutonium:

-- FAA flight regulations impose various precautionary measures, such as informing pilots of the presence of hazardous cargo, and requiring that flight crews be given special instructions concerning the hazards associated with such cargo.

Instructions as to segregation of packages of radioactive material damaged in accidents, or suspected or observed to be leaking, are set forth in FAA regulations.

-- Emergency crews at airports are aware that radioactive material or other hazardous cargo might be involved in an aircraft accident, and procedures are available for dealing with such accidents.

-- State and local police, fire and emergency departments, and federal emergency preparedness crews are, in many cases, equipped and trained to deal with hazards associated with accidents involving hazardous cargo, including radioactive material.

-- ERDA coordinates and sponsors the Interagency Radiological Assistance Program, which for about 15 years has provided crews trained and equipped to assist in evaluation, monitoring and controlling any type of radiation accident, including transportation accidents.

42. Should an aircraft accident happen involving special nuclear material -- for example, a fire following a crash -- actions by emergency crews can limit the amount of material dispersed. The fire fighting may flood the aircraft compartment or ground area in which the material has been released, causing limited dispersal, but preventing broader dispersal of particles. Following the first emergency actions, assessment of the damage and cleanups can significantly reduce further dispersal and provide for early removal of the special nuclear material under controlled conditions.

43. The potential hazard from plutonium in liquid nitrate form is not significantly different from that associated with its oxide form. The nitrate being a liquid requires greater care in packaging to prevent leakage and in packaging design to prevent

release in a fire. Under most conditions, like uranium nitrate, the nitrate is less dispersible when released.

44. Because there is a greater risk that plutonium nitrate might leak if improperly packed, the NRC recently amended its rules to require that, for shipments made after June 17, 1978, plutonium must be in solid form. The time delay to 1978 is designed to allow the industry to convert its processing equipment to the solid shipping form.

45. This change will also ensure even greater safety in the event a container transporting plutonium were in a fire. Present regulations require such a container to withstand a heat input to the container equipment to direct exposure to a very hot fire for 30 minutes. Under certain circumstances, exposure to heat input in excess of that might result in boiling of the nitrate solution causing pressure within the container that may cause the container to fail. Plutonium oxide, on the other hand, would not even liquify in those circumstances because of its high melting point.

Dr. Resnikoff's Predictions

46. The predictions of thousands of deaths due to a release of plutonium in an aircraft accident made by Dr. Resnikoff in his affidavit in support of plaintiff's motion for a preliminary injunction are based on certain unrealistic or overly conservative assumptions.

47. Amount Released. Dr. Resnikoff bases his calculations on an assumed accidental release at JFK Airport of 10,000 curies of plutonium, about 1.25 kilograms or 2.7 pounds. For the reasons explained above, the probability of a release of this large quantity in an air accident is extremely small. Moreover, Dr. Resnikoff has identified this quantity as being 2.8% of a representative shipment of plutonium which arrived by air at JFK Airport on July 29, 1974. In fact, it is half of the entire

contents of one shipping container (each of the containers in this shipment carried approximately five pounds of plutonium oxide) and the total contents of one of the two cans inside each shipping container. The probability of a significant fraction of the contents of a single shipping container being dispersed due to an aircraft accident is extremely small. In my opinion, a release of 10,000 curies of plutonium from a shipment would mean that several of the containers in the shipment would have to fail and the probability of that happening is even smaller.

48. Radiation Dosage. At my direction, experts at Brookhaven National Laboratory (BNL) assessed the radiation dosage projections made by Dr. Resnikoff. NRC staff under my supervision reviewed the BNL assessment and agreed with that assessment.[4/] A copy of the BNL assessment is attached hereto as Exhibit "E".

4/ The radiation dose to a person's lung from exposure to airborne plutonium oxide is calculated by determining the amount of plutonium inhaled which remains in the lung and multiplying that amount by a dose conversion factor. The amount of plutonium which remains in the lung is estimated on the basis of knowledge of the average concentration of plutonium in the air breathed, the volume of air breathed and the fraction of plutonium inhaled which is expected to remain in the lung (about 15% for one micron particles).

The dose conversion factors which have been used in recent studies for the calculation of exposures from the inhalation of plutonium oxide have varied over a wide range. As is the case with many of the other factors, the choice of a dose conversion factor can significantly affect the calculation of the dose from a release of plutonium. The dose to the lung from plutonium in the lung is delivered over a relatively long period of time since the half time of the deposited material in the lung is about 500 days. Estimates of the dose from inhaled plutonium are usually given in terms of dose commitment, i.e., the dose delivered to a person over a 50-year period after the intake of the plutonium.

The radiation dose to the population exposed is the sum of the doses to the individuals exposed. The population dose is expressed in man-rem.

In these analyses, we assumed very stable weather conditions (the most conservative case) and an exposed population with a density similar to New York City. Calculated population doses resulting from the dispersal of this quantity of plutonium ranged from about 0.1 to 100 million man-rem, depending upon the dispersal fraction, deposition velocity and dose conversion factors used in the calculation. Even our highest calculated population dose is at least 10 times less than Dr. Resnikoff's for similar weather conditions.

49. Dispersion and Particle Size. Dr. Resnikoff has assumed that all of the released material is dispersed in a respirable form. As indicated previously, only certain accident conditions will result in a significant release, and in those cases only a part of the released material will be dispersed in the atmosphere. In addition, of the material dispersed in air, only a part of this material will be in a form which can be inhaled into the lungs when it is released. Moreover, some fraction of that material will attach itself to particles of other inert matter in the air of a size too large to be inhaled. These assumptions by Dr. Resnikoff result in significant overestimations of the amount of plutonium available for exposure to the population.

50. Diffusion. Case A - Dr. Resnikoff's Case A represents a postulation of an incredible diffusion pattern for dispersed plutonium. This postulation would require extreme weather turbulence during the accidental release (to disperse the material) followed by total calm for several days (during which persons would be exposed to the material). Natural weather conditions do not occur to support the possibility of such a condition.

51. Cases B and C - Dr. Resnikoff uses a deposition velocity of 0.001 meters per second in his analysis. This is an extremely conservative deposition velocity; a velocity closer to 10 times

higher may be more reasonable. Even a velocity of 0.003 meters per second (which we used in one calculation) is considered to be conservative. The use of a deposition velocity of 0.001 meters per second rather than 0.003 meters per second could result in estimation of population doses four times as high.

52. Dr. Resnikoff states that wind blowing in a northwesterly direction into Manhattan is a likely wind condition. The prevailing winds at JFK Airport are from west and west-northwest, blowing toward the east or east-southeast, which would carry any dispersed plutonium away from Manhattan. The wind blows in a northwesterly direction, toward Manhattan on the average only about 3% of the time, as shown in Exhibit C.

53. Moreover, Dr. Resnikoff calculated population doses using plutonium concentrations at the center line of the plume (maximum concentrations) rather than the average concentration over the width of the plume. The centerline concentrations would be at least two times greater than the average concentrations. Furthermore, Dr. Resnikoff included persons in an area covered by concentrations as low as 1% of the maximum concentration as persons exposed to the maximum concentration.

54. Exposures. Dr. Resnikoff's analysis in all exposure situations, except the treatment of airport personnel, assumes that the size of the plume of the dispersed plutonium determines the number of individuals exposed. In the case of the airport, apparently assuming that the release occurs at or near the airport, Dr. Resnikoff further assumed that all persons at the terminal (30,000) would receive exposure at the maximum level. From the data of tables 3 and 5 of the Resnikoff analysis, the cross plume widths of the dispersed pollutant at a distance of 1 kilometer (about half a mile) from the point of release are only 121 and 303 meters (about 300 and 1000 feet) for Case B and

C, respectively. That is, about 99% of the pollutant as it is passing a point half a mile downwind is contained within about 200 feet (500 feet for Case C) of the centerline. Because the JFK Airport terminal is so large in area, should an air accident occur within half a mile of the terminal, the conditions of exposures of Case B and C would limit the affected population to about 10 to 20%, respectively, of the total population in the area. Thus the effects of the plutonium on the airport personnel estimated by Dr. Resnikoff are about 5 to 10 times higher than they actually would be.

55. Dose Conversion Factors. The dose conversion factors that have been used in recent studies to calculate plutonium lung doses vary over a wide range. Dr. Resnikoff has used an extremely conservative value in his dose calculations. The Energy Research and Development Administration in a recent study used a conversion factor which was twice as low as Dr. Resnikoff's, and the Oak Ridge National Laboratory in another study used a factor ten times as low. Moreover, in these two studies, these conversion factors were used to calculate the dose commitment, i.e., the dose delivered over a 50- or 70-year period after the intake of the plutonium at the time of the accident. The individual dose during the first month following exposure is about twenty times lower.

56. Mitigating Actions. Finally, Dr. Resnikoff does not take into account the mitigating actions that would be taken at a well-equipped airport like JFK to mitigate possible effects of the release of plutonium.

57. Considering (1) the high integrity of the containers used to transport plutonium, as discussed in the accompanying affidavit of Donald A. Nussbaumer, (2) the low probability of air accidents, as discussed in the accompanying affidavit of Herbert H. Kaiser, Jr.

(3) the fact that in more than 25 years of shipping special nuclear material, including plutonium, in civilian aircraft there have been no air accidents involving the material, (4) the several interrelated factors discussed above required before there is any significant chance of harm even if plutonium were released in an aircraft accident, and (5) the established procedures to mitigate the effects of any possible accident, it is my judgment that the risk from transportation of plutonium by air is very low.

ROBERT F. BARKER

Subscribed and sworn to
before me this 30th day
of May, 1975.

Richard W. Stringer
Notary Public

My commission expires July 1, 1978.
Montgomery County State of Maryland
Commission # 17188

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS

ROBERT F. BARKER

I am Chief of the Transportation and Product Standards Branch, Office of Standards Development, United States Nuclear Regulatory Commission. Since assuming this position with the predecessor agency AEC in January 1961, I have been responsible for the formulation of policy and development of regulatory safety standards, criteria, rules and regulations for the transportation of by-product, source and special nuclear material in the Commission's licensing program. During 1971 thru 1973, I was responsible for preparation of the sections on transportation in about 30 environmental impact statements for individual nuclear power plants, for the "generic" assessment of the environmental impact of transportation of fuel and waste from a light-water-cooled nuclear power reactor published in December 1972 as WASH-1238, and for the amendments to 10 CFR Part 51 covering the environmental effects of such transportation which became effective on February 5, 1975.

I received a Bachelor of Science in Electrical Engineering from Ohio University in 1949. I did graduate work toward a Master of Science degree in radiological physics on an AEC fellowship at the University of Rochester in 1949-50, which I received in 1953.

I was employed by the University of California at the Los Alamos Scientific Laboratory from 1950 until 1955. As assistant leader of the General Monitoring Section, I was responsible for the monitoring operations at nuclear weapons tests, around the test reactors, and for shipments coming to or leaving the laboratory. While in that position, I compiled and edited the first General Monitoring Handbook.

In 1955, I joined the Atomic Energy Commission as

Assistant Chief of the Radiation Safety Branch of the Isotopes Division and, except for the years 1959 and 1960, I have been with the Commission since that time. During 1959 and 1960, I was employed on the Staff of the International Atomic Energy Agency as a Senior Health Physicist in the Division of Health, Safety, and Waste Disposal. As part of my duties for the IAEA, I was the Secretary to the Panel of Experts called together by the Agency to establish International Standards for the Safe Transportation of Radioactive Materials.

In subsequent meetings of Panels of Experts on Transportation of Radioactive Materials organized by the IAEA, in 1963, 1964, 1970, 1971 and 1974, I represented the AEC as participant or advisor to the designated participant.

I am a Health Physicist certified by the American Board of Health Physics.

I am a member of the Health Physics Society and the American Society for Quality Control.

I am author of the Chapter on "Radiation Protection" in the Handbook on Non-Destructive Testing, an A.S.T.M. publication, co-author of a Chapter in the "Safe Transport of Radioactive Materials," edited by Roy Gibson, and have written several technical papers on safety in transportation.

/

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: 5/14/75

TO: Files

FROM: J. H. Cusack

SUBJECT: Population Dose Estimates-1

1. Basis for Dispersal

Assume that 10,000 Ci of mixed Pu oxides (including Pu-238, -239, -240 & -241) are initially airborne; that the composition is as indicated in Table A; that the weather is very stable with a wind velocity of 2m/sec; and that the height of the release is 10 m.

2. K Calculation

Dose calculation is specified as follows:

$$D = KQ(\chi/Q) \qquad 1)$$

Where D = Dose, Rem

Q = Curies Dispersed

χ/Q = Diffusion Coefficient, $\frac{\text{Ci-sec}}{m^3}/\text{Ci}$

K = Dose coefficient, Rem-m^3/Ci-sec

If the average breathing rate is taken as 20 liter/minute (or 3.33×10^{-4} m^3/sec), then

$$K = 333\ Dc \qquad 2)$$

Where Dc = Dose Commitment, Rem/microcurie uptake

Several sources for Dc values can be used:

1 An ORNL developed computer program published as Report ORNL-5003 (Feb. 1975) and based on a 50-year integration

2 Table II-G-10 of WASH-1535 based on a 70-year integration

3 Information presented by M. Resnikoff.

Dc and K values for the 3 cases are shown in Table A.

3. Dose Calculation

The χ/Q values of Equation 1 can be calculated for given locations by the following equation:

$$\chi/Q = \frac{e^{-\left(\frac{h^2}{2\sigma_z^2} + \frac{y^2}{2\sigma_y^2}\right)}}{\pi\sigma_y\sigma_z u} \cdot e^{-\frac{2V_d X}{\sigma_z u}\left(\frac{2}{\pi}\right)^{\frac{1}{2}}} \left(\frac{\text{Ci-sec}}{\text{m}^3}\right)/\text{Ci} \qquad 3)$$

Where h = Release height, m

y = Cross-wind distance, m

χ = Down-wind distance, m

u = Wind velocity, m/sec

V_d = Deposition velocity, m/sec

σ_y, σ_z = Cross-wind and vertical plume standard deviations (dependent on down-wind distance and weather stability), m

The area within a given χ/Q isopleth can be calculated by integration techniques. The people within this area will receive a dose equal to or greater than the dose calculated using Eq. 1. The results of such calculations are shown in the attached Tables 1 et. seq. Table B lists the assumptions made. In each case, h = 10 meters, a 10-hour cut-off is used, and the weather is assumed to be very stable. The 10-hour cut-off is based on the assumption that very stable conditions (which lead to the greatest man-rem totals) are most commonly a nighttime condition. Sunrise usually brings about turbulence and a rapid dilution of the already fairly dilute dispersion.

Two population densities are shown. Note that it is unlikely that as many as 10,000 people per mile will lie within the entire downwind path (about 45 miles at a wind velocity of 2 m/sec).

Three inhalability fractions are shown. It is highly unlikely that the material will be (and remain) so finely dispersed as to be 100% inhalable.

Table C summarizes the pertinent data from Tables 1 through 9.

4. Discussion

a. K Values

The ORNL derived values (Case 1) are believed to be valid for dose delivered to the l[illegible]gs.

The WASH-1535 values (Case 2) are based on lower lung weights and a longer commitment than are the ORNL values and therefore are somewhat more conservative. Further, the WASH-1535 values were apparently designed to calculate equivalent whole body doses rather than lung doses; therefore, the derived values in Tables 2, 5 and 8 are high by a factor of 3.

The Resnikoff calculation is very indirect, probably based on whole body rather than lung, and apparently assumes that all inhaled oxide is retained. For the particle size involved, only 12-20% is actually retained. Thus, to convert to lung dose, taking into account non-retention, the values in Tables 3, 6 & 9 should be divided by about 20, i.e., 3 for lung dose conversion and ~7 for non-retention.

b. Amount dispersed

The homogeneous dispersion of particulate material from a breached container is not a simple task. It is highly unlikely that 1^+ kg of oxide would be well dispersed in a puff or plume-like release.

c. Deposition velocity

For normal oxide initially lifted in an explosive-like dispersal, it is unlikely that a dispersion with as low a V_d value as 0.001 would result. Even 0.003 is probably conservative.

d. Weather

Very stable weather is the appropriately conservative case. No reasonable mechanism can be postulated to lead to Resnikoff's Case A. A wind velocity of either 1 or 2 m/sec is appropriate; the choice has little effect on total exposure.

e. High dose exposures

The highest doses occur close to the dispersal location. High population densities are unlikely in immediate proximity to the dispersal. Hence, the numbers of people shown receiving relatively high doses are strongly biased upwards by the constant population density assumption.

f. Conclusion

The values shown in the first 2 columns of Table 1 (i.e., 6.7×10^6 man-rems for a 10,000/square mile population density) are believed to be the best of the values presented. Even these are believed to be so conservative in terms of the amount of material homogeneously dispersed as to be of very low probability.

TABLE A

Isotope	Ci Fraction	Case 1		Case 2		Case 3	
		Dc	K	Dc	K	Dc	K
Pu-238	0.0123	188	6.26×10^4	910	3.03×10^5	1650	5.49×10^5
Pu-239	0.00538	177	5.89×10^4	860	2.86×10^5	1650	"
Pu-240	0.00502	177	5.89×10^4	870	2.90×10^5	1650	"
Pu-241	0.9775	0.2	66.5	2	666	1.65	549
WEIGHTED TOTAL	1.000	4.35	1.45×10^3	22.1	7.37×10^3	39.1	1.30×10^4

TABLE B

Table	K Case	V_d, m/sec	u, m/sec
1	1	.003	2
2	2	.003	2
3	3	.003	2
4	1	.001	2
5	2	.001	2
6	3	.001	2
7	1	.001	1
8	2	.001	1
9	3	.001	1

TABLE C - LUNG EXPOSURE, MAN-REM

Assumptions: Very Stable Weather
10,000 Ci Dispersed
Height of Release: 10 m
Downwind Cut-off: 10 hours
Population Concentration: 10,000/square mile*

Wind Velocity, m/sec	2						1		
Dep. Velocity, m/sec	0.003			0.001					
Inhalable Fraction	1	0.1	0.01	1	0.1	0.01	1	0.1	0.01
Based on K Values From: ORNL	6.7×10^{6}	6.7×10^{5}	5.9×10^{4}	2.7×10^{7}	2.7×10^{6}	2.7×10^{5}	2.0×10^{7}	2.0×10^{6}	2.0×10^{5}
WASH-1535	3.4×10^{7}	3.4×10^{6}	3.4×10^{5}	1.4×10^{8}	1.4×10^{7}	1.4×10^{6}	9.9×10^{7}	1.0×10^{7}	1.0×10^{6}
Resnikoff	6.1×10^{7}	6.1×10^{6}	6.0×10^{5}	2.3×10^{8}	2.4×10^{7}	2.4×10^{6}	1.6×10^{8}	1.9×10^{7}	1.9×10^{6}

*Note that population doses are directly proportional to the population density.

TABLE NO. 1

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 2 METERS/SECOND
V = 0.00300 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 1.45E+03 REM-CU.M./CI-SEC

	-------1.0------		------0.10------		-----0.010------	
FRACTION INHALABLE	----------1.00--		----------		----------	
FRACTION AIRBORNE	1.55E+03		1.55E+02		1.55E+01	
MAX. DOSE , REM	100	10000	100	10000	100	10000
POP.DENS.,PER SQ MILE	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
DOSE*, REM						
0.1	3920	392036	2604	260391	667	66595
0.2	3466	346603	2302	230214	378	37816
0.5	2945	294523	1176	117585	178	17824
1.0	2604	260391	667	66695	100	10034
2.0	2302	230214	378	37816	56	5556
5.0	1176	117585	178	17824	23	2296
10.0	667	66695	100	10034	8	793
20.0	378	37816	56	5556		
50.0	178	17824	23	2296		
100.0	100	10034	8	793		
200.0	56	5556				
500.0	23	2296				
1000.0	8	793				
2000.0						
5000.0						
10000.0						

APPROX. POP. DOSE, REM 6.72E+04 6.72E+06 6.67E+03 6.67E+05 5.85E+02 5.85E+04

TABLE NO. 2

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 2 METERS/SECOND
V = 0.00300 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 7.37E+03 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------		----------1.00----------			
[illegible]. DOSE , REM	7.90E+03		7.90E+02		7.90E+01	
POP.DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE+, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	5234	523359	3476	347616	2309	230887
0.2	4627	462707	3073	307331	1430	143037
0.5	3932	393181	2612	261152	676	67597
1.0	3476	347616	2309	230887	383	38328
2.0	3073	307331	1430	143037	217	21707
5.0	2612	261152	676	67597	102	10173
10.0	2309	230887	383	38328	56	5637
20.0	1430	143037	217	21707	30	2960
50.0	676	67597	102	10173	8	824
100.0	383	38328	56	5637		
200.0	217	21707	30	2960		
500.0	102	10170	8	824		
1000.0	56	5637				
2000.0	30	2960				
5000.0	8	824				
10000.0						

APPROX. POP. DOSE, REM 3.43E+05 3.43E+07 3.42E+04 3.42E+06 3.38E+05 3.38E+05

TABLE NO. 3

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 2 METERS/SECOND
V = 0.00300 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 1.30E+04 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------1.00----------					
MAX. DOSE , REM	1.39E+04		1.39E+03		1.39E+02	
POP.DENS.,PER 90 MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	5789	578893	3845	384502	2554	255387
0.2	5118	511806	3399	339942	2275	227526
0.5	4349	434902	2889	288863	1075	107538
1.0	3845	384502	2554	255387	610	60994
2.0	3399	339942	2275	227526	346	34580
5.0	2889	288863	1075	107538	163	16290
10.0	2554	255387	610	60994	92	9157
20.0	2275	227526	346	34580	50	5045
50.0	1075	107538	163	16290	20	2023
100.0	610	60994	92	9157	6	591
200.0	346	34580	50	5045		
500.0	163	16290	20	2023		
1000.0	92	9157	6	591		
2000.0	50	5045				
5000.0	20	2023				
10000.0	6	591				
APPROX. POP. DOSE, REM	6.07E+05	6.07E+07	6.07E+04	6.07E+06	6.02E+03	6.02E+05

TABLE NO. 4

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 2 METERS/SECOND
V = 0.00100 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 1.45E+03 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------		----------1.00----------			
MAX. DOSE , REM	3.10E+03		3.10E+02		3.10E+01	
POP.DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	5153	515345	.3509	350863	2389	238915
0.2	4590	459027	3125	312520	2128	212774
0.5	3939	393911	2682	268187	1137	113687
1.0	3509	350863	2389	238879	488	48829
2.0	3125	312520	2128	212774	210	20954
5.0	2682	268187	1137	113687	68	6786
10.0	2389	238379	488	48829	28	2763
20.0	2128	212774	210	20954	8	832
50.0	1137	113687	68	6786		
100.0	488	48829	28	2763		
200.0	210	20954	8	832		
500.0	68	6786				
1000.0	28	2763				
2000.0	8	832				
5000.0						
10000.0						

APPROX. POP. DOSE, REM 2.72E+05 2.72E+07 2.71E+04 2.71E+06 2.67E+03 2.67E+05

TABLE NO. 5

LUNG EXPOSURES
RESULTING FROM REACTOR PL DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 2 METERS/SECOND
V= 0.00100 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 7.37E+03 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------1.00----------					
MAX. DOSE , REM	1.58E+04		1.58E+03		1.58E+02	
POP.DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	6761	676065	4603	460286	3134	313378
0.2	6022	602183	4100	409985	2791	279131
0.5	5168	516759	3518	351826	2395	239535
1.0	4603	460286	3134	313378	2134	213358
2.0	4100	409985	2791	279131	1522	152245
5.0	3518	351826	2395	239535	498	49816
10.0	3134	313378	2134	213358	214	21379
20.0	2791	279131	1522	152245	91	9135
50.0	2395	239535	498	49816	28	2826
100.0	2134	213358	214	21379	9	866
200.0	1522	152245	91	9135		
500.0	498	49816	28	2826		
1000.0	214	21379	9	866		
2000.0	91	9135				
5000.0	28	2826				
10000.0	9	866				
APPROX. POP. DOSE, REM	1.39E+06	1.39E+08	1.39E+05	1.39E+07	1.38E+04	1.38E+06

TABLE NO. 6

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 2 METERS/SECOND
V = 0.00100 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 1.30E+04 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------		----------1.00----------			
MAX. DOSE , REM	2.78E+04		2.78E+03		2.78E+02	
K..DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	7433	743258	5060	506034	3445	344924
0.2	6620	662033	4507	450734	3069	306874
0.5	5681	568120	3868	386794	2633	263342
1.0	5060	506034	3445	344524	2346	234563
2.0	4507	450734	3069	306874	2089	208930
5.0	3868	386794	2633	263342	995	99517
10.0	3445	344524	2346	234563	427	42740
20.0	3069	306874	2089	208930	183	18336
50.0	2633	263342	995	99517	59	5919
100.0	2346	234563	427	42740	24	2369
200.0	2089	208930	183	18336	6	612
500.0	995	99517	59	5919		
1000.0	427	42740	24	2369		
2000.0	183	18336	6	612		
5000.0	59	5919				
10000.0	24	2369				
APPROX. POP. DOSE, REM	2.32E+06	2.32E+08	2.44E+05	2.44E+07	2.43E+04	2.43E+06

TABLE NO. 7

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 1 METERS/SECOND
V = 0.00100 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 1.45E+03 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------1.00----------					
MAX. DOSE , REM	4.43E+03		4.43E+02		4.43E+01	
POP.DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	1409	140943	1082	108179	830	83031
0.2	1302	130153	999	99897	767	76675
0.5	1171	117147	899	89915	690	69013
1.0	1082	108179	830	83031	378	37834
2.0	999	99897	767	76675	185	18466
5.0	899	89915	690	69013	71	7099
10.0	830	83031	378	37834	33	3346
20.0	767	76675	185	18466	14	1382
50.0	690	69013	71	7099		
100.0	378	37834	33	3346		
200.0	185	18466	14	1382		
500.0	71	7099				
1000.0	33	3346				
2000.0	14	1382				
5000.0						
10000.0						

APPROX. POP. DOSE, REM 2.03E+05 2.03E+07 2.03E+04 2.03E+06 2.03E+03 2.03E+05

TABLE NO. 8

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSHL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 1 METERS/SECOND
V = 0.00100 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 7.37E+03 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		-----0.10------		-----0.010------	
FRACTION AIRBORNE	----------1.00----------					
MAX. DOSE , REM	2.25E+04		2.25E+03		2.25E+02	
POP.DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	1699	169892	1304	130399	1001	100086
0.2	1569	156886	1204	120416	924	92424
0.5	1412	141209	1084	108383	832	83188
1.0	1304	130399	1001	100086	768	76820
2.0	1204	120416	924	92424	709	70939
5.0	1084	108383	832	83188	385	38481
10.0	1001	100086	768	76820	188	18783
20.0	924	92424	709	70939	91	9132
50.0	832	83188	385	38481	34	3408
100.0	768	76820	188	18783	14	1417
200.0	709	70939	91	9132	2	184
500.0	385	38481	34	3408		
1000.0	188	18783	14	1417		
2000.0	91	9132	2	184		
5000.0	34	3408				
10000.0	14	1417				
APPROX. POP. DOSE, REM	9.88E+05	9.88E+07	1.02E+05	1.02E+07	1.02E+04	1.01E+06

TABLE NO. 9

LUNG EXPOSURES
RESULTING FROM REACTOR PU DISPERSAL

1.00E+04 CURIES

VERY STABLE WEATHER
H= 10 METERS
U= 1 METERS/SECOND
V = 0.00100 METERS/SEC
DOWNWIND CUTOFF = 10 HOURS
K= 1.30E+04 REM-CU.M./CI-SEC

FRACTION INHALABLE	--------1.0------		------0.10------		-----0.010------	
FRACTION AIRBORNE	----------		----------1.00----------			
MAX. DOSE , REM	3.97E+04		3.97E+03		3.97E+02	
POP.DENS.,PER SQ MILE	100	10000	100	10000	100	10000
DOSE*, REM	----POPULATION EXPOSED TO GREATER THAN GIVEN DOSE----					
0.1	1813	181340	1392	139185	1068	106830
0.2	1675	167458	1285	128530	987	98652
0.5	1507	150724	1157	115686	888	88794
1.0	1392	139185	1068	106830	820	81996
2.0	1285	128530	987	98652	757	75719
5.0	1157	115686	888	88794	682	68153
10.0	1068	106830	820	81996	338	33795
20.0	987	98652	757	75719	165	16489
50.0	888	88794	682	68153	63	6324
100.0	820	81996	338	33795	30	2952
200.0	757	75719	165	16489	12	1160
500.0	682	68153	63	6324		
1000.0	338	33795	30	2952		
2000.0	165	16489	12	1160		
5000.0	63	6324				
10000.0	30	2952				
APPROX. POP. DOSE, REM	1.62E+06	1.62E+08	1.85E+05	1.85E+07	1.85E+04	1.85E+06

DATA FOR JFK

	1970	1972	1973
AVERAGE WIND VELOCITY METERS/SEC, ALL DIRECTIONS	5.5	5.7	6.1
PREVAILING WIND FROM (APPROXIMATE)	WEST	WNW	WEST

REFERENCE: CLIMATOLOGICAL DATA
ANNUAL SUMMARY (YEAR)
NATIONAL WEATHER RECORDS CENTER
ASHVILLE, N.C.

BROOKHAVEN DATA APPLICABLE TO JFK

PERCENT OF TIME WIND TO THE NW (FROM SE)
3.2%

AVERAGE VELOCITY OF WIND TO THE NW
5.2 METERS/SEC.

PERCENT OF TIME WIND TO THE NW (STABLE WEATHER)
3.6%

AVERAGE VELOCITY OF WIND TO NW (STABLE)
4.2 METERS/SEC.

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,

Plaintiff,

-v-

THE NUCLEAR REGULATORY COMMISSION, et.al.,

Defendants.

AFFIDAVIT

75 Civ. 2121 WCC

MONTGOMERY COUNTY)
: SS.:
STATE OF MARYLAND)

Ralph G. Page, being duly sworn, deposes and says:

1. I am employed by the United States Nuclear Regulatory Commission (NRC) as Acting Director of the Division of Safeguards within the Office of Nuclear Material Safety and Safeguards and I submit this affidavit in opposition to plaintiff's motion for a preliminary injunction.

2. Responsibilities of the Division of Safeguards include the conduct of studies and development of policies and programs for the safeguarding of special nuclear materials against risks of sabotage and theft. I have held my current position since January 1975, when the NRC was established. Prior to that date, I was an employee of the Atomic Energy Commission, having joined that organization in October 1955. Since August 1966, my duties have been concerned with the safeguarding of special nuclear material. I am qualified as an expert in that subject. A summary of my professional qualifications is attached as Exhibit A.

3. I have carefully reviewed the complaint, motions for temporary restraining order and preliminary injunction and supporting affidavits concerning the alleged risks of air transportation of special nuclear material filed by the plaintiff in this proceeding on May 5, 1975. I have prepared this affidavit both to describe the existing safeguards regulations applicable to the protection of special nuclear material in transit, as well as other

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measures now under consideration by the NRC which would further strengthen the protection of special nuclear material in transit, and to give my opinion on the safeguards advantages of shipment of special nuclear material by air over other modes of transportation.

4. Special safeguards regulations for the physical protection of these substances against theft and deliberate misuse have been adopted and are published as 10 CFR Part 73, "Physical Protection of Plants and Materials," a copy of which is attached as Exhibit B.

5. These regulations apply in pertinent part to the transportation by road, by rail, by sea and by air of strategic quantities of special nuclear materials.

6. Stragetic quantities of special nuclear materials are a fraction of those needed to make a crude nuclear explosive device. These kinds and quantities of special material are hereinafter referred to as Strategic Special Nuclear Material (SSNM).

   The regulations also govern air shipments of plutonium or U-233 in quantities exceeding 20 grams or 20 curies (whichever is less), and U-235 (contained in uranium enriched to 20% or more in the U-235 isotope) in quantities exceeding 350 grams.

7. The licensee who delivers SSNM to a carrier for transportation is required to assure compliance with the physical protection arrangements set forth in the regulations. Before the shipment is delivered to the carrier, the licensee making delivery to the carrier must obtain written certification from the licensee who is to take delivery of the shipment at the f.o.b. point that these arrangements have been made.

8. Each licensee who imports SSNM must assure that such material will be protected pursuant to the aforementioned physical protection regulations at the first terminal at which it arrives in the United States and all subsequent terminals. An individual designated by the licensee or his

agent, or as specified by the contract of carriage, must confirm the container count and examine locks and/or seals for evidence of tampering, at the first place in the United States at which the shipment is discharged from the arriving carrier.

9. Each licensee who exports SSNM must comply with the physical protection arrangements up to the first point where the shipment is taken off the vehicle outside the United States.

10. The physical protection arrangements apply with equal force to the import transportation of SSNM from their initial point of entry into the U.S. to their licensee destination, and to the domestic transportation of SSNM between licensees within the U.S.

11. The above regulations were published in effective form November 6, 1973 and became effective on March 6, 1974. Earlier, on February 1, 1973, they were published in the Federal Register in proposed form. All interested persons were invited to submit suggestions and comments before the protection regulations were issued in effective form. A 60-day public comment period was allowed. No person who commented suggested that air transport of plutonium should be prohibited. The plaintiff State of New York did not submit comments.

12. The NRC maintains a force of inspectors in the field to inspect selected shipments of SSNM at various points en route to assure that the protection requirements are being followed.

13. In addition, licensees have a strong economic motivation to safeguard their special nuclear materials. For example, a 10 kilogram shipment of plutonium oxide is worth about $100,000.

14. Pursuant to 10 CFR Parts 30, 40, 70, and 150 NRC and Agreement State Licensees* must advise the NRC of each transfer and receipt of special nuclear material of 1 gram or more of contained uranium-235, uranium-233

*The Agreement State licensing program, of which New York State is a member, is described in the affidavit of G. Wayne Kerr.

or plutonium. According to the records of the NRC and its predecessor, the AEC, no shipment of special nuclear material, whether in strategic quantities or lesser amounts has ever been sabotaged or stolen. On the basis of this experience over the past 25 years with respect to the safeguarding of special nuclear material in transit, we have found no basis upon which to predicate the inadequacy of existing safeguards regulations.

15. The requirements for the protection of special nuclear materials are being continually assessed and changes are initiated when additional protection appears to be needed. Recent concerns in both NRC as well as the Congress with the possibility of theft or sabotage have led to several new developments intended to further strengthen the protection of special nuclear material. These concerns are based on three relatively recent developments: 1) increases in terrorist activity; 2) the availability of information on methods for constructing nuclear explosive devices; and 3) projected increased amounts of special nuclear material as a result of future increased reliance on nuclear power for the generation of electricity.

16. The NRC is actively studying the safeguards problems associated with expanded reliance on nuclear power and the need to minimize sabotage and theft risks associated therewith. For example, newly proposed regulations to further strengthen the protection of SSNM were published in the Federal Register on November 13, 1974. A copy of the Federal Register notice is appended hereto as Exhibit C. Among other things, the proposed regulations call for SSNM shipments by air to be accompanied by two guards. Interested persons were requested to submit comments within 30 days after the date of publication. Comments on the proposed rules, including comments from the State of New York, have been received and are presently under evaluation. It should be noted that none of the comments have suggested that air shipments of these materials be banned.

17. On May 6, 1975, the President of the United States submitted to Congress his report regarding "Nuclear Safeguards and the Export of Nuclear Technology and Materials." This report was prepared in response to

Section 14 of the "Export Administration Amendments of 1974" (P.L. 93-500), which became effective October 29, 1974. Section 14 thereof provides as follows:

> "Sec. 14. The President is directed to review all laws, regulations issued thereunder by the Atomic Energy Commission, the Department of Commerce, and other Government agencies, governing the export and re-export of materials, supplies, articles, technical data or other information relating to the design, fabrication, development, supply, repair or replacement of any nuclear facility or any part thereof, and to report within six months to the Congress on the adequacy of such regulations to prevent the proliferation of nuclear capability for nonpeaceful purposes. The President is also directed to review domestic and international nuclear safeguards and to report within six months to the Congress on the adequacy of such regulations to prevent the proliferation, diversion, or theft of all such nuclear materials and on efforts by the United States and other countries to strengthen international nuclear safeguards in anticipation of the Review Conference scheduled to be held in February 1975 pursuant to Article VIII, section 3 of the Treaty on the Non-Proliferation of Nuclear Weapons."

This report was prepared by the Energy Research and Development Administration with assistance by the NRC, Office of Management and Budget, Arms Control and Disarmament Agency, Council on International Economic Policy, Central Intelligence Agency, and the Departments of Commerce, Defense, Justice and State.

18. This report was submitted with a covering letter from the President which stated his judgment as to the effectiveness of current laws governing the export and re-export of nuclear materials including domestic safeguards (which include SSNM) as follows:

> "I have concluded that current laws provide ample authority to control the export and re-export of nuclear-related material, equipment and technology. Nevertheless, existing policies and regulations are constantly being reexamined and changed as appropriate. Domestic safeguards are under continuing review for the purpose of making them even more effective. The international safeguard system will detect and thus help to deter efforts to divert such materials by other nations."

The President's report and covering letter are annexed hereto as Exhibit D.

19. Since April 4, 1974, the NRC has requested that all licensees subject to the provisions of 10 CFR Part 73 give 7 days advance notice to NRC of any pending shipments of SSNM. On April 4, 1975, this request was published in the Federal Register as a proposed amendment to 10 CFR Part 73. Public comment was solicited for a period of 30 days following the date of publication. Neither the State of New York nor any other person who commented proposed that air shipments be banned.

Copies of the proposed amendment and the State of New York's comments are attached hereto as Exhibits D and E.

20. Section 204(b)(2)(C) of the Energy Reorganization Act of 1974 directs the NRC to conduct a study of the need for and feasibility of establishing a security agency within the NRC for the performance of safeguards functions. That study, with a projected budget of $675,000, is underway and is expected to be submitted to the Congress by January 1976.

21. In August 1974, the AEC staff circulated for comment a draft "Generic Environmental Statement on Mixed Oxide Fuel" assessing the environmental impacts of possible widespread use of recycle plutonium as fuel for nuclear electric generating plants. The study recognized a need for more stringent safeguards procedures in the event of widescale use of plutonium fuel. The staff has underway a broad study of these safeguards issues, with a projected budget of about $2 million. The study will be coordinated with the Congressionally-mandated security agency study.

22. Air transportation of special nuclear materials has significant advantages over other modes of transportation from the physical protection standpoint. Because transit time is minimized, the opportunity for theft or acts of sabotage is correspondingly reduced. Cargo security experts generally agree that the risk of theft or sabotage decreases as the dwell time of the cargo in the transportation system is minimized. Additionally, while SSNM is aboard a cargo aircraft in flight, the only potential source of hijacking is from those already aboard the aircraft. However, SSNM, or any other cargo, which is transported by rail, sea, or road is subject to potential hijacking from external sources during the entire dwell time of the cargo in the transportation system.

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23. Given current safeguards requirements and considering all relevant factors, I do not believe that air transportation of special nuclear materials presently poses a substantial risk to the public health and safety from possible acts of sabotage or theft.

Ralph G. Page

Sworn to and subscribed
before me this 14th day
of May, 1975.

NOTARY PUBLIC

My commission expires July 1, 1978.

EXHIBIT A

STATEMENT OF QUALIFICATIONS

RALPH G. PAGE

1. I am the Acting Director, Division of Safeguards, United States Nuclear Regulatory Commission (NRC), a position which I have held since January 19, 1975, the date on which the NRC was established. I am responsible for safeguards policy assessment, program development, and licensing reviews. My business address is Washington, D.C. 20555.

2. I received a Bachelor's degree in Chemistry and Mathematics from Augustina College in 1954. I attended the University of Washington on an Atomic Energy Commission Fellowship in Radiological Physics in 1954-55.

3. From 1972 to 1975, I was Chief, Materials and Plant Protection Branch, U.S. Atomic Energy Commission (AEC), Directorate of Licensing, Washington, D.C. I was responsible for the review of applicants' materials security and plant protection procedures; for the issuance of related license amendments, exemptions, and special license conditions; and for the continuing evaluation of the effectiveness of applicable materials and plant protection requirements.

4. From 1967 to 1972, I was Assistant Director for Licensing and Regulations, AEC, Washington, D.C. My duties were similar to those of my current position.

5. From 1962 to 1967, I was Chief, Enforcement Branch, AEC, Washington, D.C. I was responsible for the review of compliance inspection reports and for the issuance of enforcement actions in instances where licensees were found to be out of compliance with applicable regulatory requirements.

6. During 1966 and 1967, I served as Secretary to the AEC Ad Hoc Advisory Panel on Safeguarding Special Nuclear Material.

7. From 1955 to 1962, I was employed by the AEC as a health physicist in Oak Ridge, Tennessee and Washington, D.C. I was responsible for reviewing the adequacy of radiation safety programs proposed and implemented by licensees for protecting the public against radiation hazards.

8. I am a member of the Health Physics Society and a member of the Institute of Nuclear Materials Management.

9. I have participated in meetings of the International Atomic Energy Agency as the NRC representative for matters pertaining to the physical protection of nuclear plants and materials.

10. I have published the following papers concerning safeguards for nuclear materials:

"Physical Protection of Special Nuclear Material in Transit," Conference on Transportation of Radioactive Material, University of Virginia, Charlottesville, Virginia.

"The Division of Nuclear Materials Safeguards - The Second Year," 11th Annual Meeting of Institute of Nuclear Materials Management, Gatlinburg, Tennessee.

"U.S. Safeguards Experience in Regulation and Inspection of the Private Nuclear Industry," Symposium on Safeguards Techniques, [illegible], West Germany.

"Materials and Plant Protection: United States Regulatory Systems of Accounting For, Protection Of, and Control of Nuclear Materials, IAEA Panel on Systems of Accounting for and Control of Nuclear Material, Tokyo, Japan.

"AEC Experience in Applying Strengthened Physical Protection Requirements," Institute of Nuclear Materials Management, Atlanta, Georgia.

Exhibit B

PART 73

PHYSICAL PROTECTION OF PLANTS AND MATERIALS

(As republished 12/28/73, unless otherwise indicated)

GENERAL PROVISIONS

Sec.

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PHYSICAL PROTECTION REQUIREMENTS AT FIXED SITES

73.40 Physical protection: General requirements at fixed sites.
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73.60 Additional requirements for the physical protection of special nuclear material at fixed sites.

RECORDS AND REPORTS

73.70 Records.
73.71 Reports of unaccounted for shipments, suspected theft, unlawful diversion, or industrial sabotage.

ENFORCEMENT

73.80 Violations.
Appendix A—United States Atomic Energy Commission Regulatory Operations Regional Offices.

GENERAL PROVISIONS

§ 73.1 Purpose and scope.

(a) *Purpose.* This part prescribes requirements for physical protection of special nuclear material at fixed sites and in transit and of plants in which special nuclear material is used, for the purpose of protection against acts of industrial sabotage and protection of special nuclear material against theft by establishment and maintenance of a physical protection system of: (1) Protective barriers and intrusion detection devices at fixed sites to provide early detection of an attack, (2) deterrence to attack by means of armed guards and escorts, and (3) liaison and communication with law enforcement authorities capable of rendering assistance to counter such attacks.

(b) *Scope.* (1) This part prescribes requirements for (i) the physical protection of production and utilization facilities licensed pursuant to Part 50 of this chapter; (ii) the physical protection of plants in which activities licensed pursuant to Part 70 of this chapter are conducted, and the physical protection of special nuclear material, by any person who pursuant to the regulations in Part 70 of this chapter possesses or uses at any site or contiguous sites subject to control by the licensee, uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium alone or in any combination in a quantity of 5,000 grams or more computed by the formula, grams=(grams contained U-235)+2.5 ★(grams U-233+grams plutonium).

(2) This part prescribes requirements for the physical protection of special nuclear material in transportation by any person who is licensed pursuant to the regulations in Part 70 of this chapter who imports, exports, transports, delivers to a carrier for transport in a single shipment, or takes delivery of a single shipment free on board at the point where it is delivered to a carrier, either uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium, or any combination of these materials, which is 5,000 grams or more computed by the formula, grams=(grams contained U-235)+2.5 (grams U-233+grams plutonium).

(3) This part also applies to shipments by air of special nuclear material in quantities exceeding (i) 20 grams or 20 curies, whichever is less, of plutonium or uranium-233, or (ii) 350 grams of uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope).

(4) Special nuclear material subject to this part may also be protected pursuant to security procedures prescribed by the Commission or another Government agency for the protection of classified materials. The provisions and requirements of this part are in addition to, and not in substitution for, any such security procedures. Compliance with the requirements of this part does not relieve any licensee from any requirement or obligation to protect special nuclear material pursuant to security procedures prescribed by the Commission or other Government agency for the protection of classified materials.

§ 73.2 Definitions.

As used in this part:

(a) Terms defined in Parts 50 and 70 of this chapter have the same meaning when used in this part.

(b) "Authorized individual" means any individual, including an employee, a consultant, or an agent of a licensee, who has been designated in writing by a licensee to have responsibility for surveillance of special nuclear material.

(c) "Guard" means a uniformed individual armed with a firearm whose primary duty is the protection of special nuclear material against theft and/or the protection of a plant against industrial sabotage.

(d) "Watchman" means an individual, not necessarily uniformed or armed with a firearm, who provides protection for a plant and the special nuclear material therein in the course of performing other duties.

(e) "Continuous visual surveillance" means unobstructed view at all times of a shipment of special nuclear material, and of all access to a temporary storage

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area or cargo compartment containing the shipment.

(f) "Physical barrier" means

(1) Fences constructed of No. 11 American wire gauge, or heavier wire fabric, topped by three strands or more of barbed wire or similar material on brackets angled outward between 30° and 45° from the vertical, with an overall height of not less than eight feet, including the barbed topping.

(2) Building walls constructed of stone, brick, cinder block, concrete, steel or comparable materials (openings in which are secured by grates, doors, or covers of construction and fastening of sufficient strength such that the integrity of the wall is not lessened by any opening), or walls of similar construction, not part of a building, provided with a barbed topping described in paragraph (f)(1) of this section of a height of not less than 8 feet.

(3) Ceilings and floors constructed to offer resistance to penetration equivalent to that of building walls described in paragraph (f)(2) of this section.

(g) "Protected area" means an area encompassed by physical barriers and to which access is controlled.

(h) "Vital area" means any area which contains vital equipment within a structure, the walls, roof, and floor of which constitute physical barriers of construction at least as substantial as walls as described in paragraph (f) of this section.

(i) "Vital equipment" means any equipment, system, device, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation. Equipment or systems which would be required to function to protect public health and safety following such failure, destruction, or release are also considered to be vital.

(j) "Material access area" means any location which contains special nuclear material, within a vault or a building, the roof, walls, and floor of which each constitute a physical barrier.

(k) "Isolation zone" means any area, clear of all objects which could conceal or shield an individual, adjacent to a physical barrier, which is monitored to detect the presence of individuals or vehicles within that area.

(l) "Intrusion alarm" means a tamper indicating electrical, electromechanical, electrooptical, electronic or similar device which will detect intrusion by an individual into a building, protected area, vital area, or material access area, and alert guards or watchmen by means of actuated visible and audible signals.

(m) "Lock" in the case of vaults or vault type rooms means a three-position, manipulation resistant, dial type, built-in combination lock or combination padlock and in the case of fences, walls, and buildings means an integral door lock or padlock which provides protection equivalent to a six-tumbler cylinder lock. "Lock" in the case of a vault or vault type room also means any manipulation resistant, electromechanical device which provides the same function as a built-in combination lock or combination padlock, which can be operated remotely or by the "reading" or insertion of information, which can be uniquely characterized, and which allows operation of the device. "Locked" means protected by an operable lock.

(n) "Vault" means a burglar-resistant windowless enclosure with walls, floor and roof of: (1) Steel at least one-half inch thick, (2) reinforced concrete or stone at least 8 inches thick, (3) non-reinforced concrete or stone at least 12 inches thick, or (4) monolithic floor or roof construction of equivalent resistance to entry, with a built-in lock in a steel door at least 1 inch thick, exclusive of the locking mechanism.

(o) "Vault-type room" means a room with one or more doors, all capable of being locked, protected by an intrusion alarm which creates an alarm upon the entry of a person anywhere into the room and upon exit from the room or upon movement of an individual within the room.

(p) "Industrial sabotage" means any deliberate act directed against a plant in which an activity licensed pursuant to the regulations in this chapter is conducted, or to any component of such a plant, which could directly or indirectly endanger the public health and safety by exposure to radiation, other than such acts by an enemy of the United States, whether foreign government or other person.

§ 73.3 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by any officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized as binding upon the Commission.

§ 73.4 Communications.

Except where otherwise specified, all communications and reports concerning the regulations in this part should be addressed to the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, or may be delivered in person at the Commission's offices at 1717 H Street, NW., Washington, D.C.; at 7920 Norfolk Avenue, Bethesda, Maryland; or at Germantown, Maryland.

§ 73.5 Specific exemptions.

The Commission may, upon application of any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security, and are otherwise in the public interest.

§ 73.6 Exemptions for certain quantities and kinds of special nuclear material.

A licensee is exempt from the requirements of §§ 73.30 through 73.36 and of §§ 73.60 and 73.70 of this part, with respect to the following special nuclear material:

(a) Uranium-235 contained in uranium enriched to less than 20 percent in the U-235 isotope:

(b) Special nuclear material which is not readily separable from other radioactive material and which has a total external radiation dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding; and

(c) Special nuclear material in a quantity not exceeding 350 grams of uranium-235, uranium-233, plutonium, or a combination thereof, possessed in any analytical, research, quality control, metallurgical or electronic laboratory.

Physical Protection of Special Nuclear Material in Transit

§ 73.30 General requirements.

(a) Except as specified in § 73.36(a) or as otherwise authorized pursuant to § 73.30(f), each licensee who transports or who delivers to a carrier for transport either uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium, or any combination of these materials, which is 5,000 grams or more computed by the formula, grams= (grams contained U-235)+2.5 (grams U-233+grams plutonium), shall make arrangements to assure that such special nuclear material will, if a common or contract carrier is used, be transported under the established procedures of a carrier which provides a system for the physical protection of valuable material in transit and requires an exchange of hand-to-hand receipts at origin and destination and at all points enroute where there is a transfer of custody.

(b) Transit times of shipments other than those specified in § 73.1(b)(3) shall be minimized and routes shall be selected to avoid areas of natural disaster or civil disorders. Such shipments shall be preplanned to assure that deliveries occur at a time when the receiver at the final delivery point is present to accept receipt of shipment.

(c) Special nuclear material shall be shipped in containers which are sealed by tamper indicating type seals. The container shall also be locked if it is not in another container or vehicle which is locked. If inspection of the container or vehicle is not required by State or local authorities before final destination, the outermost container or vehicle shall also be sealed by tamper indicating type seals. No container weighing 500 pounds or less shall be shipped in open trucks, railroad flat cars or box cars and ships. This paragraph does not apply to shipments of quantities specified in § 73.1(b)(3).

(d) When guards are used pursuant to §§ 73.31(c)(1), 73.31(c)(2), 73.33 and 73.35, the licensee shall not permit an individual to act as a guard unless there is documentation that the individual has been qualified by demonstrating an understanding of his duties and responsibilities. The licensee or his agent shall have documentation that guards have been requalified annually.

(e) By January 7, 1974, each licensee shall submit a plan outlining the procedures that will be used to meet the requirements of §§ 73.30 through 73.36 and 73.70(g) including a plan for the selection, qualification, and training of armed escorts, or the specification and design of a specially designed truck or trailer as appropriate. This plan shall be followed by the licensee after March 6, 1974.

(f) A licensee or applicant for a license may apply to the Commission for approval of proposed procedures for transport of special nuclear material in a manner not otherwise authorized by the regulations of this part. Such application shall include a description and quantity of the special nuclear material involved, the origin and destination, the carriers to be used, the expected time in transit, the number of transfer points, the communications to be used, the vehicle visual identification, and the cargo security and surveillance measures to be used.

(g) Paragraphs (b), (c), (d), and (f) of this section are effective March 6, 1974.

§ 73.31 Shipment by road.

(a) All shipments by road shall be made without any scheduled intermediate stops to transfer special nuclear material or other cargo between the facility from which it is shipped and the facility of the receiver.

(b) All motor vehicles used to transport special nuclear material shall be equipped with a radiotelephone which can communicate with a licensee or his agent. The licensee or agent with whom communications shall be maintained for different segments of the shipment shall be predesignated before a shipment is made. Calls to such licensee or agent shall be made at least every 2 hours when radiotelephone or conventional telephone coverage along the route is available to relay position and projected route. Call frequency may extend up to 5 hours when radiotelephone or conventional telephone coverage is not available along the preplanned route, at which time a conventional telephone call shall be made. In the event no call is received in accordance with these requirements, the licensee or his agent shall immediately notify an appropriate law enforcement authority and the appropriate Atomic Energy Commission Regulatory Operations Regional Office listed in Appendix A of this part.

(c) A shipment shall be accompanied by at least two people in the vehicle containing the shipment, which may be two drivers or one driver and an authorized individual. The vehicle containing the shipment shall be under continuous visual surveillance, or one of the drivers or authorized individuals shall be in the cab of the vehicle, awake, and not in a sleeper berth. The shipment shall be further protected by one of the following methods:

(1) An armed escort consisting of at least two guards shall accompany the shipment in a separate escort vehicle. Escorts shall maintain continuous vigilance for the presence of conditions or situations which might threaten the security of the shipment, take such action as cir-

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cumstances might require to avoid interference with continuous safe passage of the cargo vehicle, provide assistance to, or summon aid for crew of cargo vehicles in case of emergency, check seals and locks at each stop where time permits, and observe the cargo vehicle and adjacent areas during stops or layovers. Continuous radio communication capability shall be provided between the cargo vehicle and the escort vehicle. Escort vehicles shall also be equipped with a radiotelephone. The licensee may use his own employees as armed escorts or he may use an agent. Only the driver is required in the vehicle containing special nuclear material for shipments involving an average of less than an hour in transportation, if communication is maintained during the course of the shipment with the licensee or agent monitoring the shipment.

(2) The shipment shall be made in a specially designed truck or trailer which reduces the vulnerability to diversion. Design features of the truck or trailer shall permit immobilization of the van and provide barriers or deterrents to physical penetration of the cargo compartment unless armed guards are also used in which case immobilization of the vehicle is not required.

(d) Transfers to and from other modes of transportation shall be in accordance with § 73.35.

(e) Vehicles shall be marked on top with identifying letters or numbers which will permit identification of the vehicle under daylight conditions from the air in clear weather at 1,000 feet above ground level. The same code of letters and numbers as those used on the top shall also be marked on the sides and rear of the vehicle to permit identification from the ground.

(f) This section is effective March 6, 1974.

§ 73.32 Shipment by air.

(a) Except as specifically approved by the Atomic Energy Commission, no shipment of special nuclear material shall be made in passenger aircraft in excess of (1) 20 grams or 20 curies, whichever is less, of plutonium or uranium-233, or (2) 350 grams of uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope).

(b) In shipments on cargo aircraft of either uranium-235 (contained in uranium enriched to [illegible] percent or more in the U-235 isotope), uranium-233 or plutonium, or any combination of these materials which is [illegible] or more computed by the formula: grams = (grams contained U-235 [illegible] grams U-233 + grams plutonium), transfers shall be in accordance with § 73.35. Transfers shall be minimized.

(c) Export shipments shall be escorted by an unarmed authorized individual, who may be a crew member, from the last terminal in the United States until the shipment is unloaded at a foreign terminal. He shall perform monitoring duties at foreign terminals as described in § 73.35.

(d) Paragraph (c) of this section is effective March 6, 1974.

§ 73.33 Shipment by rail.

(a) A shipment by rail shall be escorted by two guards, in the shipment car or an escort car of the train, who shall keep the shipment cars under observation and who shall detrain at stops when practicable and time permits to guard the shipment cars under observation, and check car or container locks and seals. Radiotelephone communication shall be maintained with a licensee or his agent to relay position every 2 hours or less, and at scheduled stops in the event that radiotelephone coverage was not available in the last 5 hours before the stop. The licensee or agent with whom communications shall be maintained for different segments of the shipment shall be predesignated before a shipment is made. In the event no call is received in accordance with these requirements, the licensee or his agent shall immediately notify an appropriate law enforcement authority and the appropriate Atomic Energy Commission Regulatory Operations Regional Office listed in Appendix A of this part.

(b) Transfers shall be in accordance with § 73.35.

(c) This section is effective March 6, 1974.

§ 73.34 Shipment by sea.

(a) Shipments shall be made on vessels making the minimum ports of call. Transfers to and from other modes of transportation shall be in accordance with § 73.35. There shall be no scheduled transfers to other ships. At domestic ports of call where other cargo is transferred, the shipments shall be protected in accordance with § 73.35(a).

(b) The shipment shall be placed in a secure compartment which is locked and sealed. Locks and seals shall be periodically inspected in transit, if accessible, by an escort or crew member.

(c) Export shipments shall be escorted by an unarmed authorized individual, who may be a crew member, from the last port in the United States until the shipment is unloaded at a foreign port. He shall perform monitoring duties at foreign ports as described in § 73.35.

(d) Ship-to-shore communications shall be available, and a ship-to-shore contact shall be made every twenty-four hours to relay position information, and the status of the shipment, which shall be determined by a daily inspection where possible. This information shall be sent, as often as it is available, to the licensee or his agent who makes the arrangements for the protection of the shipment.

(e) This section is effective March 6, 1974.

§ 73.35 Transfer of special nuclear material.

All transfers shall be monitored by a guard. An alternate guard shall be designated at all transfer points to substitute, if necessary. Monitoring of special nuclear material transfers shall be conducted as follows:

(a) At scheduled intermediate stops where special nuclear material is not scheduled for transfer, the guard shall observe the opening of the cargo compartment and assure that the shipment is not removed. The guard shall maintain continuous visual surveillance of the cargo compartment. Continuous visual surveillance of the cargo compartment shall be maintained up to the time the vehicle is ready to depart. The guard shall observe the vehicle until it has departed, and shall notify the licensee or his agent of the latest status immediately thereafter.

(b) At points where special nuclear material is transferred from a vehicle to storage, from one vehicle to another, or from storage to a vehicle, the guard shall keep the shipment under continuous visual surveillance by observing the opening of the cargo compartment of the incoming vehicle and assuring that the shipment is complete by checking locks and/or seals. Continuous visual surveillance of a shipment shall be maintained at all times it is in the terminal or in storage. Shipments shall be preplanned in order to avoid storage times in excess of 24 hours. Continuous visual surveillance of the cargo compartment shall be maintained up to the time the vehicle is ready to depart from the terminal. The guard shall observe the vehicle until it has departed, and shall notify the licensee or his agent of the latest status immediately thereafter.

(c) The guard shall be required to immediately notify the carrier and the licensee who made the arrangements for protection of special nuclear material of any deviation from or attempted interference with schedule or routing.

(d) This section is effective March 6, 1974.

§ 73.36 Miscellaneous requirements.

(a) Each licensee who takes delivery of special nuclear material free on board (f.o.b.) the point at which it is delivered to a carrier for transport shall make the arrangements to assure that such special nuclear material will be protected in transit as prescribed in §§ 73.30 through 73.35, rather than the person who delivers such shipment to the carrier for transport.

(b) Each licensee who imports special nuclear material shall make arrangements to assure that such material will be protected in transit as follows:

(1) An individual designated by the licensee or his agent, or as specified by a contract of carriage, shall confirm the container count and examine locks and/or seals for evidence of tampering, at the first place in the United States at which the shipment is discharged from the arriving carrier.

(2) The shipment shall be protected at the first terminal at which it arrives in the United States and all subsequent terminals as provided in §§ 73.30 through 73.35 and paragraphs (c) and (f) of this section.

(c) (1) Each licensee who delivers special nuclear material to a carrier for transport shall immediately notify the consignee by telephone, telegraph, or teletype, of the time of departure of the shipment, and shall notify or confirm with the consignee the method of transportation, including the names of carriers and the estimated time of arrival of the shipment at its destination. (2) In the case of a shipment free on board (f.o.b.) the point where it is delivered to a carrier for transport, each licensee shall, before the shipment is delivered to the carrier, obtain written certification from the licensee who is to take delivery of the shipment at the f.o.b. point that the physical protection arrangements required by §§ 73.30 through 73.35 for licensed shipments have been made. When an AEC license-exempt contractor is the consignee of a shipment, the licensee shall, before the shipment is delivered to the carrier, obtain written certification from the contractor who is to take delivery of the shipment at the f.o.b. point that the physical protection arrangements required by AEC Manual Chapters 2401 or 2405 have been made. (3) Each licensee who delivers special nuclear material to a carrier for transport shall also make arrangements with the consignee to be notified immediately by telephone, telegraph, or teletype, of the arrival of the shipment at its destination.

(d) In addition to complying with the requirements specified in paragraphs (c) and (f) of this section, each licensee who exports special nuclear material shall comply with the requirements specified in §§ 73.30 through 73.35, as applicable, up to the first point where the shipment is taken off the vehicle outside the United States. The licensee shall also make arrangements with the consignee to be notified immediately by telephone and telegraph, teletype, or cable, of the arrival of the shipment at its destination, or of any such shipment that is lost or unaccounted for after the estimated time of arrival at its destination.

(e) Each licensee who receives a shipment of special nuclear material shall immediately notify the person who delivered the material to a carrier for transport of the arrival of the shipment at its destination. In the event such a shipment fails to arrive at its destination at the estimated time, the consignee, if a licensee, or in the case of an export shipment, the licensee who exported the shipment, shall immediately notify by telephone and telegraph, or teletype, the Director of the appropriate Atomic Energy Commission Regulatory Operations Regional Office listed in Appendix A of this part, and the licensee or other person who delivered the material to a carrier for transport. The licensee who made the physical protection arrangements shall also immediately notify by telephone and telegraph, or teletype the Director of the appropriate Atomic Energy Commission Regulatory Operations Regional office listed in Appendix A of the action being taken to trace the shipment.

(f) Each licensee who makes arrangements for physical protection of a shipment of special nuclear material as required by §§ 73.30 through 73.36 shall immediately conduct a trace investiga-

tion of any shipment that is lost or unaccounted for after the estimated arrival time and file a report with the Commission as specified in § 73.71. If the licensee who conducts the trace investigation is not the consignee, he shall also immediately report the results of his investigation by telephone and telegraph, or teletype to the consignee.

(g) Paragraphs (a), (b), (c) and (d) of this section are effective March 6, 1974.

Physical Protection Requirements at Fixed Sites

§ 73.40 Physical protection: General requirements at fixed sites.

Each licensee shall provide physical protection against industrial sabotage and against theft of special nuclear material at the fixed sites where licensed activities are conducted. Security plans submitted to the Commission for approval shall be followed by the licensee after March 6, 1974.

§ 73.50 Requirements for physical protection of licensed activities.

In addition to any other requirements of this part, each licensee who is authorized to operate a fuel reprocessing plant pursuant to Part 50 of this chapter or who possesses or uses uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium alone or in any combination in a quantity of 5000 grams or more computed by the formula, grams = (grams contained U-235) + 2.5 (grams U-233 + grams plutonium), other than in the operation of a nuclear reactor licensed pursuant to Part 50 of this chapter, shall comply with the following.

(a) *Physical security organization.* (1) The licensee shall establish a security organization, including guards, to protect his facility against industrial sabotage and the special nuclear material in his possession against theft.

(2) At least one supervisor of the security organization shall be on site at all times.

(3) The licensee shall establish, maintain and follow written security procedures which document the structure of the security organization and which detail the duties of guards, watchmen, and other individuals responsible for security.

(4) The licensee shall not permit an individual to act as a guard or watchman unless such individual has been properly trained and equipped and has qualified by demonstrating: (i) An understanding of the licensee's security procedures, and (ii) the ability to execute all duties required of him by such procedures. Each guard and watchman shall be requalified at least annually. Such requalification shall be documented.

(b) *Physical barriers.* (1) The licensee shall locate vital equipment only within a vital area, which, in turn, shall be located within a protected area such that access to vital equipment requires passage through at least two physical barriers. More than one vital area may be within a single protected area.

(2) The licensee shall locate material access areas only within protected areas such that access to the material access area requires passage through at least two physical barriers. More than one material access area may be within a single protected area.

(3) The physical barrier at the perimeter of the protected area shall be separated from any other barrier designated as a physical barrier within the protected area, and the intervening space monitored or periodically checked to detect the presence of persons or vehicles so that the facility security organization can respond to suspicious activity or to the breaching of any physical barrier.

(4) An isolation zone shall be maintained around the physical barrier at the perimeter of the protected area and any part of a building used as part of that physical barrier. The isolation zone shall be monitored to detect the presence of individuals or vehicles within the zone so as to allow response by armed members of the licensee security organization to be initiated at the time of penetration of the protected area. Parking facilities, both for employees and visitors, shall be located outside the isolation zone.

(5) Isolation zones and clear areas between barriers shall be provided with illumination sufficient for the monitoring required by paragraph (b) (3) and (4) of this section, but not less than 0.2 foot candles.

(c) *Access requirements.* The licensee shall control all points of personnel and vehicle access into a protected area, including shipping or receiving areas, and into each vital area. Identification of personnel and vehicles shall be made and authorization shall be checked at such points.

(1) At the point of personnel and vehicle access into a protected area, all individuals, except employees who possess an AEC personnel security clearance, and all hand-carried packages shall be searched for devices such as firearms, explosives, and incendiary devices, or other items which could be used for industrial sabotage. The search shall be conducted either by a physical search or by the use of equipment capable of detecting such devices. Employees who possess an AEC personnel security clearance shall be searched at random intervals. Subsequent to search, drivers of delivery and service vehicles shall be escorted at all times while within the protected area.

(2) All packages being delivered into the protected area shall be checked for proper identification and authorization. Packages other than hand-carried packages shall be searched at random intervals.

(3) A picture badge identification system shall be used for all individuals who are authorized access to protected areas without escort.

(4) Access to vital areas and material access areas shall be limited to individuals who are authorized access to vital equipment or special nuclear material

and who require such access to perform their duties. Authorization for such individuals shall be provided by the issuance of specially coded numbered badges indicating vital areas and material access areas to which access is authorized. Unoccupied vital areas and material access areas shall be protected by an active intrusion alarm system.

(5) Individuals not employed by the licensee shall be escorted by a watchman, or other individual designated by the licensee, while in a protected area and shall be badged to indicate that an escort is required. In addition, each individual not employed by the licensee shall be required to register his name, date, time, purpose of visit, employment affiliation, citizenship, name and badge number of the escort, and name of the individual to be visited. Except for a driver of a delivery or service vehicle, an individual not employed by the licensee who requires frequent and extended access to a protected area or a vital area need not be escorted provided such individual is provided with a picture badge, which he must receive upon entrance into the protected area and which he must return each time he leaves the protected area, which indicates (i) nonemployee-no escort required, (ii) areas to which access is authorized, and (iii) the period for which access has been authorized.

(6) No vehicles used primarily for the conveyance of individuals shall be permitted within a protected area except under emergency conditions.

(7) Keys, locks, combinations, and related equipment shall be controlled to minimize the possibility of compromise and promptly changed whenever there is evidence that they have been compromised. Upon termination of employment of any employee, keys, locks, combinations, and related equipment to which that employee had access shall be changed.

(d) *Detection aids.* (1) All alarms required pursuant to this part shall annunciate in a continuously manned central alarm station located within the protected area and in at least one other continuously manned station, not necessarily within the protected area, such that a single act cannot remove the capability of calling for assistance or otherwise responding to an alarm. All alarms shall be self-checking and tamper indicating. The annunication of an alarm at the onsite central alarm station shall indicate the type of alarm (e.g., intrusion alarm, emergency exit alarm, etc.) and location. All intrusion alarms, emergency exit alarms, alarm systems, and line supervisory systems shall at minimum meet the performance and reliability levels indicated by GSA Interim Federal Specification W-A-00450 B (GSA-FSS).

(2) All emergency exits in each protected area and each vital area shall be alarmed.

(e) *Communication requirements.* (1) Each guard or watchman on duty shall be capable of maintaining continuous communication with an individual in a continuously manned central alarm station within the protected area, who shall be capable of calling for assistance from other guards and watchmen and from local law enforcement authorities.

(2) The alarm stations required by paragraph (d)(1) of this section shall have conventional telephone service for communication with the law enforcement authorities as described in paragraph (e)(1) of this section.

(3) To provide the capability of continuous communication, two-way radio voice communication shall be established in addition to conventional telephone service between local law enforcement authorities and the facility and shall terminate at the facility in a continuously manned central alarm station within the protected area.

(4) All communications equipment, including offsite equipment, shall remain operable from independent power sources in the event of loss of primary power.

(f) *Testing and maintenance.* Each licensee shall test and maintain intrusion alarms, emergency alarms, communications equipment, physical barriers, and other security related devices or equipment utilized pursuant to this section as follows:

(1) All alarms, communications equipment, physical barriers, and other security related devices or equipment shall be maintained in operable and effective condition.

(2) Each intrusion alarm shall be functionally tested for operability and required performance at the beginning and end of each interval during which it is used for security, but not less frequently than once every seven (7) days.

(3) Communications equipment shall be tested for operability and performance not less frequently than once at the beginning of each security personnel work shift.

(g) *Response requirement.* (1) The licensee shall establish liaison with local law enforcement authorities. In developing his physical security plan, the licensee shall take account of the probable size and response time of the local law enforcement authority assistance.

(2) Upon detection of abnormal presence or activity of persons or vehicles within an isolation zone, a protected area, a material access area or a vital area, or upon evidence of intrusion into a protected area, a material access area or a vital area, the facility security organization shall (i) determine whether or not a threat exists, (ii) assess the extent of the threat, if any, and (iii) take immediate measures to neutralize the threat, either by appropriate action by facility guards or by calling for assistance from local law enforcement authorities, or both.

(h) This section is effective March 6, 1974.

§ 73.60 Additional requirements for the physical protection of special nuclear material at fixed sites.

In addition to the applicable requirements of § 73.50, each licensee who pursuant to the regulations in Part 70 of this chapter possesses at any site or contiguous sites subject to control by the

licensee uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium alone or in any combination in a quantity of 5,000 grams or more computed by the formula, grams=(grams contained U-235) + 2.5 (grams U-233 + grams plutonium) shall protect the special nuclear material from theft or diversion as follows:

(a) *Access requirements.* (1) Special nuclear material shall be stored or processed only in a material access area. No activities other than those which require access to special nuclear material or equipment employed in the process, use, or storage of special nuclear material, shall be permitted within a material access area.

(2) Material access areas shall be located only within a protected area to which access is controlled.

(3) Special nuclear material not in process shall be stored in a vault equipped with an intrusion alarm or in a vault-type room, and each such vault or vault-type room shall be controlled as a separate material access area.

(4) Enriched uranium scrap in the form of small pieces, cutings, chips, solutions or in other forms which result from a manufacturing process, contained in 30-gallon or larger containers, with a uranium-235 content of less than 0.25 grams per liter, may be stored within a locked and separately fenced area which is within a larger protected area provided that the storage area is no closer than 25 feet to the perimeter of the protected area. The storage area when unoccupied shall be protected by a guard or watchman who shall patrol at intervals not exceeding 4 hours, or by intrusion alarms.

(5) Admittance to a material access area shall be under the control of authorized individuals and limited to individuals who require such access to perform their duties.

(6) Prior to entry into a material access area, packages shall be searched for devices such as firearms, explosives, incendiary devices, or counterfeit substitute items which could be used for theft or diversion of special nuclear material.

(7) Methods to observe individuals within material access areas to assure that special nuclear material is not diverted shall be provided and used on a continuing basis.

(b) *Exit requirement.* Each individual, package, and vehicle shall be searched for concealed special nuclear material before exiting from a material access area unless exit is into a contiguous material access area. The search may be carried out by a physical search or by use of equipment capable of detecting the presence of concealed special nuclear material.

(c) *Detection aid requirement.* Each unoccupied material access area shall be locked and protected by an intrusion alarm on active status. All emergency exits shall be continuously alarmed.

(d) *Testing and maintenance.* Each licensee shall test and maintain intrusion alarms, physical barriers, and other devices utilized pursuant to the requirements of this section as follows:

(1) Intrusion alarms, physical barriers, and other devices used for material protection shall be maintained in operable condition.

(2) Each intrusion alarm shall be inspected and tested for operability and required functional performance at the beginning and end of each interval during which it is used for material protection, but not less frequently than once every seven (7) days.

(e) This section is effective March 6, 1974.

Records and Reports

§ 73.70 Records.

Each licensee subject to the provisions of §§ 73.30 through 73.36 and/or § 73.50 and/or § 73.60 shall keep the following records:

(a) Names and addresses of all individuals who have been designated as authorized individuals.

(b) Names, addresses, and badge numbers of all individuals authorized to have access to vital equipment or special nuclear material, and the vital areas and material access areas to which authorization is granted.

(c) A register of visitors, vendors, and other individuals not employed by the licensee recorded pursuant to § 73.50(c)(5).

(d) A log indicating name, badge number, time of entry, reason for entry, and time of exit of all individuals granted access to a normally unoccupied vital area.

(e) Documentation of all routine security tours and inspections, and of all tests, inspections, and maintenance performed on physical barriers, intrusion alarms, communications equipment, and other security related equipment used pursuant to the requirements of this part.

(f) A record at each onsite alarm annunciation location of each alarm, false alarm, alarm check, and tamper indication that identifies the type of alarm, location, alarm circuit, date, and time. In addition, details of response by facility guards and watchmen to each alarm, intrusion, or other security incident shall be recorded.

(g) Shipments of special nuclear material subject to the requirements of this part, including names of carriers, major roads to be used, flight numbers in the case of air shipments, dates and expected times of departure and arrival of shipments, names and addresses of the monitor and one alternate monitor at each transfer point, verification of communication equipment on board the transfer vehicle, names of individuals who are to communicate with the transport vehicle, container seal descriptions and identification, and any other information to confirm the means utilized to comply with §§ 73.30 through 73.36. Such information shall be recorded prior to shipment. Information obtained during the course of the shipment such as reports of all communications, change of shipping plan including monitor changes, trace in-

vestigations and others shall also be recorded.

(h) Procedures for controlling access to protected areas and for controlling access to keys for locks used to protect special nuclear material.

§ 73.71 Reports of unaccounted for shipments, suspected theft, unlawful diversion, or industrial sabotage.

(a) Each licensee who conducts a trace investigation of a lost or unaccounted for shipment pursuant to § 73.36(f) shall immediately report to the Director of the appropriate Atomic Energy Commission Regulatory Operations Regional Office listed in Appendix A, by telephone, telegram, or teletype, the details and results of his trace investigation and shall file within a period of fifteen (15) days a written report to the Director of the appropriate Regulatory Operations Regional Office with a copy to the Director of Regulatory Operations, U.S. Atomic Energy Commission, Washington, D.C. 20545, setting forth the details and results of the trace investigation.

(b) Each licensee shall report immediately to the Director of the appropriate Atomic Energy Commission Regulatory Operations Regional Office listed in Appendix A, by telephone, telegram, or teletype, any incident in which an attempt has been made, or is believed to have been made, to commit a theft or unlawful diversion of special nuclear material which he is licensed to possess, or to commit an act of industrial sabotage against his plant. The initial report shall be followed within a period of fifteen (15) days by a written report submitted to the Director of the appropriate Regulatory Operations Regional Office, with a copy to the Director of Regulatory Operations, U.S. Atomic Energy Commission, Washington, D.C. 20545, setting forth the details of the incident. Subsequent to the submission of the written report required by this paragraph, a licensee shall immediately inform the Director of the appropriate Regulatory Operations Regional Office by means of a written report of any substantive additional information, which becomes available to the licensee, concerning the incident.

ENFORCEMENT

§ 73.80 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or any regulation or order issued thereunder. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of sections 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act or any rule, regulation, or order issued thereunder, or any term, condition, or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. Any person who willfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a crime and upon conviction, may be punished by fine or imprisonment or both, as provided by law.

APPENDIX A

U.S. ATOMIC ENERGY COMMISSION REGULATORY OPERATIONS REGIONAL OFFICES

Region and address	Telephone	
	Daytime	Night and holidays
Region I, Directorate of Regulatory Operations, USAEC, 631 Park Ave., King of Prussia, Pa. 19406.	215-337-1150	215-337-1150.
Region II, Directorate of Regulatory Operations, USAEC, Suite 818, 230 Peachtree St. NW., Atlanta, Ga. 30303.	404-526-4503	404-526-4503.
Region III, Directorate of Regulatory Operations, USAEC, 799 Roosevelt Rd., Glen Ellyn, Ill. 60137.	312-858-2660	312-739-7711.
Region V, Directorate of Regulatory Operations, USAEC, P.O. Box 1515, Berkeley, Calif. 94701.	*415-486-3141	415-273-4237.

For the purposes of this regulation, the geographical areas assigned to the regional offices are as follows:

REGION I

Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

REGION II

Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, and West Virginia.

REGION III

Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, and Wisconsin.

REGION V

Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming.

*Amended

Exhibit C

ATOMIC ENERGY COMMISSION

[10 CFR Part 73]

PHYSICAL PROTECTION OF PLANTS AND MATERIALS

Physical Protection of Special Nuclear Material in Transit

In view of the need for increased protection of special nuclear material (SNM) in the interest of the common defense and security, the Atomic Energy Commission is proposing amendments to its regulations in 10 CFR Part 73, "Physical Protection of Plants and Materials," which would provide for an increased level of physical protection for shipments by licensees of special nuclear material of high strategic value. This action is being

taken in view of the increase in terrorist activities and the general availability of information concerning possible use of special nuclear material as a basis of terrorist activities.

The proposed amendments would apply to shipments of either uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope) uranium-233, or plutonium, or any combination of these materials, which is 5,000 grams or more computed by the formula, grams=(grams contained U-235)+2.5 (grams U-233+grams plutonium).

The proposed amendments would require that shipment by road be made either in a truck or trailer with special design features to improve cargo security containing at least two armed guards accompanied by a separate escort vehicle with at least two armed guards, or that an armored car be used accompanied by two separate escort vehicles each containing two armed guards (total of six guards) when communication is not always available during the course of the shipment because of inadequate communication range, or that an armored car containing at least two armed guards be used accompanied by one escort vehicle with at least two armed guards when communication coverage is always available during the course of the shipment.

Other proposed changes would require (1) two armed guards to escort all air and sea shipments, (2) five armed guards to escort rail shipments, (3) use of U.S. registered carriers only for air and sea shipments, (4) two armed guards to monitor transfers, (5) seals at all times on cargo compartments of trucks or the outermost container of SNM, (6) open railroad cars only when the shipment weighs 5,000 pounds or more, and (7) submission of a revised plan updating existing transportation plans by licensees who ship at or above 10 CFR 73 threshold quantities and through licensees by carriers who supply transportation services. The Commission is considering alternatives which would discontinue the armored car option and would allow only shipment via specially designed truck with an escort vehicle. Also, alternatives to implement a continuous communication network for truck and rail shipments are being examined. It is expected that these measures could be required early in 1976.

The Commission has decided not to prepare an environmental impact statement for the proposed amendments to 10 CFR Part 73. Concurrently with the publication of this notice of proposed rule making, the Commission is making available in its Public Document Room at 1717 H Street NW., Washington, D.C. its "Environmental Impact Appraisal of Amendments to 10 CFR Part 73, Require for the Physical Protection of Strategic Nuclear Materials in Transit".

Pursuant to the Atomic Energy Act of 1954, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments to Title 10, Chapter I, Code of Federal Regulations, Part 73 is contemplated. All interested persons who wish to submit written comments or suggestions for consideration in connection with the proposed amendments should send them to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Docketing and Service Section by December 13, 1974. Copies of Comments on the proposed amendments may be examined at the Commission's Public Document Room at 1717 H Street NW, Washington, D.C.

1. Paragraph (g) is deleted and paragraphs (c) and (e) of § 73.30 are amended to read as follows:

§ 73.30 General requirements.

* * * * *

(c) Special nuclear material shall be shipped in containers which are sealed by tamper indicating type seals. The container shall also be locked if it is not in another container or vehicle which is locked. The outermost container or vehicle shall also be sealed by tamper indicating type seals. Only containers weighing 5,000 pounds or more shall be shipped in open railroad cars. This paragraph does not apply to shipments of quantities specified in § 73.1(b)(3).

* * * * *

(e) By (sixty days after publication) each licensee who has previously submitted a plan to ship quantities of special nuclear material in excess of those specified in § 73.1(b)(2) shall update his plan outlining the procedures that will be used to meet the new requirements of §§ 73.30(c), 73.31(c), 73.32 (b) and (c), 73.33(a), 73.34 (a), (b) and (c), and 73.35 (a) and (b).

* * * * *

2. Paragraph (f) is deleted and paragraph (c) of § 73.31 is amended to read as follows:

§ 73.31 Shipment by road.

* * * * *

(c) A shipment shall be accompanied by at least two guards in the vehicle containing the shipment. The shipment shall be further protected by one of the following methods:

(1) The shipment shall be made in a specially designed truck or trailer which reduces the vulnerability to theft. Design features of the truck or trailer shall permit immobilization of the van and provide barriers or deterrents to physical penetration of the cargo compartment. A separate escort vehicle, with at least two guards shall accompany the shipment. Guards shall maintain continuous vigilance for the presence of conditions or situations which might threaten the security of the shipment, take such action as circumstances might require to avoid interference with continuous safe passage of the cargo vehicle, provide assistance to, or summon aid for crew of cargo vehicles in case of emergency, check seals and locks at each stop where time permits, and observe the cargo vehicle and adjacent areas during stops. The vehicle containing the shipment shall be under continuous visual surveillance by at least two guards during rest stops. Continuous radio communication capability shall be provided between the cargo vehicle and the escort vehicles. Escort vehicles shall also be equipped with a radiotelephone. The licensee may use his own employees as guards or he may use an agent.

(2) The shipment shall be made in an armored car accompanied by two separate escort vehicles with at least two guards in each vehicle when the ability to communicate by radiotelephone or radio is not always available during the course of the shipment because of inadequate communication range. When communication coverage is always available during the course of the shipment, armored car shipments may be made with only one separate escort vehicle containing at least two guards. The escorts' duties shall be the same as those specified in § 73.31(c)(1).

* * * * *

3. Paragraph (d) is deleted and paragraphs (b) and (c) of § 73.32 are amended to read as follows:

§ 73.32 Shipment by air.

* * * * *

(b) Shipments on cargo aircraft of either uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233 or plutonium, or any combination of these materials which is 5,000 grams or more computed by the formula, grams=(grams contained U-235)+2.5 (grams U-233+grams plutonium) shall be made only on U.S. registered aircraft and shall be accompanied by two guards. Transfers of these shipments shall be minimized and shall be conducted in accordance with § 73.35.

(c) Export shipments shall be accompanied by two guards from the last terminal in the United States until the shipment is unloaded at a foreign terminal. They shall perform monitoring duties at foreign terminals as described in § 73.35, except that such guards need not be armed at foreign terminals.

4. Paragraph (c) is deleted and paragraph (a) of § 73.33 is amended to read as follows:

§ 73.33 Shipment by rail.

(a) A shipment by rail shall be escorted by five guards, in the shipment car or an escort car of the train, who shall keep the shipment cars under observation and who shall detrain at stops when practicable and time permits to guard the shipment cars under observation and check car or container locks and seals. Radiotelephone communication shall be maintained with a licensee or his agent to relay position every 2 hours or less, and at scheduled stops in the event that radiotelephone coverage was not available in the last 5 hours before the stop. The licensee or agent with whom communications shall be maintained for different segments of the shipment shall be predesignated before a shipment is made. In the event no call is received in accordance with these requirements, the licensee or his agent shall immediately notify an appropriate

law enforcement authority and the appropriate Atomic Energy Commission Regulatory Operations Regional Office listed in Appendix A of this part.

• • • • • •

5. Paragraph (e) is deleted and paragraphs (a), (b), and (c) of § 73.34 are amended to read as follows:

§ 73.34 Shipment by sea.

(a) Shipments shall be made on American flag vessels making the minimum ports of call. Transfers to and from other modes of transportation shall be in accordance with § 73.35, except that such guards need not be armed at foreign terminals.

(b) Export shipments shall be accompanied by two guards from the last port in the United States until the shipment is unloaded at a foreign port. They shall perform monitoring duties at foreign ports as described in § 73.35, except that such guards need not be armed at foreign terminals.

(c) The shipment shall be placed in a secure compartment which is locked and sealed. Locks and seals shall be periodically inspected in transit, if possible, by the two guards.

• • • • •

6. Paragraph (d) is deleted and paragraphs (a) and (b) of § 73.35 are amended to read as follows:

§ 73.35 Transfer of special nuclear material.

All transfers shall be monitored by two guards. Monitoring of special nuclear material transfers shall be conducted as follows:

(a) At scheduled intermediate stops where special nuclear material is not scheduled for transfer, the guards shall observe the opening of the cargo compartment and assure that the shipment is not removed. The guards shall maintain continuous visual surveillance of the cargo compartment. Continuous visual surveillance of the cargo compartment shall be maintained up to the time the vehicle is ready to depart.

(b) At points where special nuclear material is transferred from vehicle to storage, from one vehicle to another, or from storage to a vehicle, the guards shall keep the shipment under continuous visual surveillance by observing the opening of the cargo compartment of the incoming vehicle and assuring that the shipment is complete by checking locks and/or seals. Continuous visual surveillance of a shipment shall be maintained at all times it is in the terminal or in storage. Shipments shall be preplanned in order to avoid storage times in excess of 24 hours. Continuous visual surveillance of the cargo compartment shall be maintained up to the time the vehicle is ready to depart from the terminal.

• • • • •

(Sec. 161, Pub. L. 83-703, 68 Stat. 948 (42 U.S.C. 2201))

Dated Washington, D.C. the 7th day of November 1974.

For the Atomic Energy Commission.

GORDON M. GRANT,
Assistant Secretary of the Commission.

[FR Doc.74-26569 Filed 11-12-74;8:45 am]

[10 CFR Part 73]

PHYSICAL PROTECTION OF PLANTS AND MATERIALS

Requirements for the Physical Protection of Nuclear Power Reactors

The Atomic Energy Commission has under consideration amendments to its regulations in 10 CFR Part 73, "Physical Protection of Plants and Materials," which, in the interest of the common defense and security and the public health and safety, would identify measures to be taken for the protection of all nuclear power reactors against industrial sabotage. Part 50 of the Commission's regulations now requires licensees to submit physical security plans developed, in part, to protect against sabotage. Guidance as to physical security criteria generally acceptable for the protection of nuclear power reactors against acts of industrial sabotage is provided by Regulatory Guide 1.17, "Protection of Nuclear Power Plants Against Industrial Sabotage," which references ANSI Standard N18.17, "Industrial Security for Nuclear Power Plants."

The proposed amendments to 10 CFR Part 73 would establish in a new § 73.55 specific requirements for nuclear power reactor licensees to establish a physical security organization, to provide access control to and within the nuclear power reactor using qualified and trained guards, and to establish other physical security measures including communications, liaison with local law enforcement authority, and visitor restrictions for non-employees.

The new § 73.55 would apply to persons who are licensed or who apply for a license to operate a nuclear power reactor regardless of the enrichment or type of special nuclear material to be used in the reactor. Such persons who store or possess special nuclear material of certain types, enrichments, and amounts (other than in a reactor core or in irradiated fuel) must also comply with the requirements of 10 CFR 73.50 and 73.60 which deal with the physical protection of special nuclear material. A proposed amendment to § 73.50 of 10 CFR Part 73 would clarify which persons licensed to operate nuclear reactors are required to meet the physical protection requirements of § 73.50.

In addition, an appropriate change would be made to § 73.70, *records*, to reflect the addition of § 73.55.

If the Commission adopts the proposed amendments to 10 CFR Part 73, each licensee would be given a period of 90 days following the publication in the FEDERAL REGISTER to submit a physical security plan. In addition, each licensee would be given a period of 180 days after approval of a security plan or amended plan in which to fully implement such plans and comply with the requirements of these rules.

Concurrently with the publication for comments of this notice of proposed rule making, the Commission is making available in its Public Document Room at 1717 H Street NW., Washington, D.C. its "Environmental Impact Appraisal of Proposed Amendments to 10 CFR Part 73, Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Industrial Sabotage." Since the requirements of the proposed rule would not significantly affect the quality of the human environment, the Commission has decided not to prepare an environmental impact statement for the proposed amendments to 10 CFR Part 73.

Pursuant to the Atomic Energy Act of 1954, as amended, and section 553 of Title 5 of the United States Code, notice is hereby given that adoption of the following amendments to 10 CFR Part 73 is contemplated. All interested persons who desire to submit written comments or suggestions with respect to the foregoing, or any other matter pertinent to the subject of this notice, should send them to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Docketing and Service Section, by January 13, 1975.

Copies of comments on the proposed amendments may be examined in the Commission's Public Document Room at 1717 H Street NW., Washington, D.C.

PART 73—PHYSICAL PROTECTION OF PLANTS AND MATERIALS

1. The introductory language of § 73.50 is amended to read as follows:

§ 73.50 Requirements for physical protection of licensed activities.

In addition to any other requirements of this part, each licensee who is authorized to operate a fuel reprocessing plant pursuant to Part 50 of this chapter or who possesses or uses uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium alone or in any combination in a quantity of 5,000 grams or more computed by the formula, grams = (grams contained U-235) + 2.5 (grams U-233 + grams plutonium), including licensees who are authorized to operate a nuclear reactor pursuant to Part 50 of this chapter who possess or store such material shall comply with the following requirements. The requirements of this section do not apply to reactor licensees who possess such material only when it is inserted or located in the core of a nuclear reactor and/or who possess or store such material only when it is contained in irradiated fuel elements removed from the reactor core.

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2. A new § 73.55 is added to read as follows:

§ 73.55 Requirements for physical protection of licensed activities in nuclear power reactors against industrial sabotage.

Each applicant for a license to operate a nuclear power reactor pursuant to Part 50 of this chapter shall include in the physical security plan required by § 50.34 (c) the information identified in paragraphs (a) through (g) of this section. Each licensee who is authorized to operate a nuclear power reactor licensed pursuant to Part 50 of this chapter shall submit an amended physical security plan describing how the licensee will comply with the following requirements by (90 days after publication of effective rule). The licensee shall implement his plan and comply with the provisions of this physical security section within a period of 180 days from the date of Commission approval of the amended physical security plan.

(a) *Physical security organization.*

(1) The licensee shall establish a security organization including guards, to protect his facility against industrial sabotage.

(2) At least one supervisor of the security organization shall be on site at all times.

(3) The licensee shall establish, maintain and follow written security procedures which document the structure of the security organization and which detail the duties of guards, watchmen, and other individuals responsible for security.

(4) The licensee shall not permit an individual to act as a guard or watchman unless such individual has been properly trained and qualified and has demonstrated: (i) an understanding of the licensee's security procedures, and (ii) the ability to execute all duties required of him by such procedures. Each guard and watchman shall be requalified at least annually. Such requalification shall be documented.

(b) *Physical barriers.*

(1) The licensee shall locate vital equipment only within a vital area, which in turn, shall be located within a protected area such that access to vital equipment requires passage through at least two physical barriers. More than one vital area may be located within a single protected area.

(2) The physical barrier at the perimeter of the protected area shall be separated from any other barrier designated as a physical barrier within the protected area, and the intervening space monitored or periodically checked to detect the presence of persons or vehicles so that the facility security organization can respond to suspicious activity or to the breaching of any physical barrier.

(3) An isolation zone shall be maintained around the physical barrier at the perimeter of the protected area and any part of a building used as part of that physical barrier. The isolation zone shall be monitored to detect the presence of individuals or vehicles within the zone so as to allow response by armed members of the licensee security organization to be initiated at the time of penetration of the protected area. Parking facilities, both for employees and visitors, shall be located outside the isolation zone.

(4) Isolation zones and clear areas between barriers shall be provided with illumination sufficient for the monitoring and observation requirements of paragraphs (b)(2), (b)(3) and (g)(3) of this section.

(5) Windows in walls and doors of the control room as well as the doors themselves, shall provide bullet penetration resistance. In addition, a means shall be provided for quickly locking all doors leading into the control room.

(c) *Access requirements.*

(1) The licensee shall control all points of personnel and vehicle access into a protected area. Identification and search of all personnel shall be made and authorization shall be checked at such points. At these control points, the search function shall be physically separate from the identification function and shall proceed progessively from the detection of firearms and explosives to identification and admission, if approved. The search shall be conducted either by a physical search or by the use of equipment capable of detecting such devices. During any access control function the individual(s) performing the identification and controlling admittance shall be housed in a suitable structure capable of providing physical protection to the occupants to assure their ability to respond or to summon assistance.

(2) At the point of personnel and vehicle access into a protected area, all hand-carried packages shall be searched for devices such as firearms, explosives, and incendiary devices, or other items which could be used for industrial sabotage.

(3) All packages for delivery into the protected area shall be checked for proper identification and authorization. To the extent practicable all vehicles shall be off loaded outside the protected area. All such cargo shall be checked for items which could be used for sabotage purposes prior to entry into the protected area. If vehicle access into the protected area is required, the vehicle and cargo shall be searched upon entry for explosives and incendiary devices or other items which could be used for industrial sabotage. Either the driver of the vehicle permitted access into the protected area shall possess an AEC personnel security clearance, or the vehicle shall be driven by an employee of the licensee while within the protected area.

(4) A picture badge identification system shall be used for all individuals who are authorized access to protected areas without escort. An individual not employed by the licensee but who requires frequent and extended access to protected and vital areas may be authorized access to such areas without escort provided that he receives a picture badge upon entrance into the protected area which must be returned upon exit from the protected area and which indicates (i) non-employee—no escort required; (ii) areas to which access is authorized and (iii) the period for which access has been authorized.

(5) Individuals not authorized by the licensee to enter protected areas without escort shall be escorted by a watchman, or other individual designated by the licensee, while in a protected area and shall be badged to indicate that an escort is required. In addition, each such individual shall be required to register his name, date, time, purpose of visit, employment affiliation, citizenship, name and badge number of escort, and name of the individual to be visited.

(6) The licensee shall control all points of personnel and vehicle access into vital areas. Access to vital areas shall be permitted for individuals who are authorized access to vital equipment and who require such access to perform their duties. Authorization for access to vital areas for such individuals shall be indicated by a badge identification system. Unoccupied vital areas shall be protected by an active intrusion alarm system.

(7) Access to containment shall be through doors or hatches of substantial construction and installation and shall be locked or otherwise secured to offer penetration resistance and impede both surreptitious and forced entry. Any time frequent access is permitted to containment such as during refueling or major maintenance, positive access control to containment shall be exercised by the licensee, with a guard or watchman.

(8) Appropriate barriers shall be provided to obstruct ready access to vital areas such as the containment by ground vehicles (e.g., trucks). Any time vehicle access is permitted, positive access control shall be exercised by the licensee using guards or watchmen.

(9) Visiting by non-employees within vital areas for the purpose of general familiarization and other non-work-related activities shall not be authorized except for good cause shown to the licensee.

(10) No vehicles used primarily for the conveyance of individuals except designated emergency or security vehicles shall be permitted within a protected area except under emergency conditions.

(11) Keys, locks, combinations and related equipment used to control access to protected and vital areas shall be controlled to reduce to the extent practicable the probability of compromise and promptly changed whenever there is evidence that they may have been compromised.

(d) *Detection aids.*

(1) All alarms required pursuant to this part shall annunciate in a continuously manned central alarm station located within the protected area and in at least one other continuously manned station, not necessarily on site, such that a single act cannot remove the capability of calling for assistance or

otherwise responding to an alarm. The on site central alarm station shall be considered a vital area. The walls, doors, ceilings and any windows in the walls and/or in the doors shall provide bullet penetration resistance. Where practicable, the on site central alarm station shall be located within a building such that is is not visible from the isolation zone.

(2) All alarms shall be self-checking and tamper indicating. The annunciation of an alarm at the on site central alarm station shall indicate the type of alarm (e.g., intrusion alarm, emergency exit alarm, etc.) and location. All intrusion alarms, emergency exit alarms, alarm systems and line supervisory systems shall at minimum meet the performance and reliability levels indicated by GSA Interim Federal Specification W-A-00450 B (GSA-FSS).

(3) All emergency exits in each protected area and each vital area shall be alarmed.

(e) *Communication requirements.*

(1) Each guard or watchman on duty shall be capable of maintaining continuous communication with an individual in a continuously manned central alarm station within the protected area who shall be capable of calling for assistance from other guards and watchmen and from local law enforcement authorities.

(2) The alarm stations required by paragraph (d)(1) of this section shall have conventional telephone service for communication with the law enforcement authorities as described in paragraph (e)(1) of this section.

(3) To provide the capability of continuous communication, radio or microwave transmitted two-way voice communication, either directly or through an intermediary shall be established in addition to conventional telephone service, between local law enforcement authorities and the facility and shall terminate in a continuously manned central alarm station within the protected area.

(4) Non-portable communications equipment required by this section shall remain operable from independent power sources in the event of the loss of primary power.

(f) *Testing and maintenance.*

Each licensee shall test and maintain intrusion alarms, emergency alarms, communications equipment, physical barriers, and other security related devices or equipment utilized pursuant to this section as follows:

(1) All alarms, communication equipment, physical barriers, and other security related devices or equipment shall be maintained in operable and effective condition.

(2) Each intrusion alarm shall be functionally tested for operability and required performance at the beginning and end of each interval during which it is used for security, but not less frequently than once every seven (7) days.

(3) Communications equipment required for communications on site shall be tested for operability and performance not less frequently than once at the beginning of each security personnel work shift. Communications equipment required for communications off site shall be tested for operability and performance not less than once a day.

(g) *Response requirement.*

(1) The licensee shall establish liaison with local law enforcement authorities. In developing his physical security plan, the licensee shall take account of the probable size and response time of the local law enforcement authority assistance.

(2) Upon detection of abnormal presence of activity of persons or vehicles within an isolation zone, a protected area, or a vital area, or upon evidence of intrusion into a protected area or vital area, the facility security organization shall (i) determine whether or not a threat exists, (ii) assess the extent of that threat, if any, and (iii) take immediate measures to neutralize the threat, either by appropriate action by facility guards or by calling for assistance from local law enforcement authorities, or both.

(3) To facilitate initial response to detection of penetration of the protected area and assessment of the possible existence of a threat while affording protection of the security organization members who may be responding, a capability of observing the isolation zone and the clear area adjacent to the physical barrier at the perimeter of the protected area shall be provided, preferably by means of closed circuit television, or by other suitable means which limit exposure of responding personnel to possible attack.

3. The prefatory language of § 73.70 is changed to read as follows:

Each licensee subject to the provisions of §§ 73.30 through 73.36 and/or § 73.50 and/or § 73.55 and/or § 73.60 shall keep the following records:

* * * * *

(Sec. 161, Pub. L. 83-703, 68 Stat. 948, Pub. L. 93-377, 88 Stat. 475 (42 U.S.C. 2201))

Dated at Washington, D.C. this 7th day of November 1974.

For The Atomic Energy Commission.

GORDON M. GRANT,
Assistant Secretary of the Commission.

[FR Doc.74-26574 Filed 11-12-74;8:45 am]

EXHIBIT D

FOR IMMEDIATE RELEASE MAY 6, 1975

Office of the White House Press Secretary

THE WHITE HOUSE

TO THE CONGRESS OF THE UNITED STATES:

In accordance with Section 14 of Public Law 93-500, the "Export Administration Amendments of 1974", I am forwarding to the Congress a report on U.S. laws and regulations governing nuclear exports and on domestic and international safeguards. This report considers the effectiveness of such laws and safeguards in preventing the diversion of nuclear capabilities to nonpeaceful purposes.

I have concluded that current laws provide ample authority to control the export and reexport of nuclear-related material, equipment and technology. Nevertheless, existing policies and regulations are constantly being reexamined and changed as appropriate. Domestic safeguards are under continuing review for the purpose of making them even more effective. The international safeguard system will detect and thus help to deter efforts to divert such materials by other nations.

As the volume of material and the nature of facilities grow in the world, commensurate increases and improvements in the international safeguarding system will be needed. The United States is encouraging the strengthening of international safeguards by aiding and supporting IAEA safeguard development efforts. It is also seeking to enhance physical security through the adoption of an international convention. The U.S. is taking the lead in advocating in-depth physical protection measures necessary to preclude terrorist groups from capturing such material or conducting sabotage activities.

I wish to assure Congress that the prevention of the proliferation of nuclear weapons or the acquisition of nuclear explosive materials for possible nonpeaceful uses is a priority concern in my Administration. Whatever efforts are needed to allow the U.S. and other countries to enjoy the benefits of nuclear power, without fear, will be taken by the Government of the United States.

GERALD R. FORD

THE WHITE HOUSE,
May 6, 1975

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Presidential Report to the Congress
Regarding
Laws and Regulations Governing Nuclear Exports
and
Domestic and International Nuclear Safeguards

March 31, 1975

This report has been prepared by the Energy Research and Development Administration with assistance by the Nuclear Regulatory Commission, Office of Management and Budget, Arms Control and Disarmament Agency, Council on International Economic Policy, Central Intelligence Agency, and the Departments of Commerce, Defense, Justice and State.

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Annex A - Domestic Nuclear Safeguards (Background Information)

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A. EXECUTIVE SUMMARY

Purpose

This report is in response to Section 14 of the "Export Administration Amendments of 1974" (P.L. 93-500), which became effective October 29, 1974, regarding "Nuclear Safeguards and the Export of Nuclear Technology and Materials."

Section 14 of the Export Administration Amendments of 1974, states:

> "Sec. 14. The President is directed to review all laws, regulations issued thereunder by the Atomic Energy Commission, the Department of Commerce, and other Government agencies, governing the export and re-export of materials, supplies, articles, technical data or other information relating to the design, fabrication, development, supply, repair or replacement of any nuclear facility or any part thereof, and to report within six months to the Congress on the adequacy of such regulations to prevent the proliferation of nuclear capability for nonpeaceful purposes. The President is also directed to review domestic and international nuclear safeguards and to report within six months to the Congress on the adequacy of such safeguards to prevent the proliferation, diversion, or theft of all such nuclear materials and on efforts by the United States and other countries to strengthen international nuclear safeguards in anticipation of the Review Conference scheduled to be held in February 1975 pursuant to Article VIII, section 3 of the Treaty on the Non-Proliferation of Nuclear Weapons."

Background

The Atomic Energy Commission (now Energy Research and Development Administration and Nuclear Regulatory Commission) has carried out the U.S. policy established under the Eisenhower Administration for the Atoms for Peace Program and the Atomic Energy Act of 1954, as amended, of promoting the development of international cooperation in the peaceful uses of atomic energy under controls which would prevent the proliferation of nuclear weapons. (Refer to Annex B for further discussion.) This program has been carried out in collaboration with the Department of State and other agencies.

Comprehensive export controls over nuclear and nuclear-related facilities, materials, and technology have been implemented pursuant to the export licensing authority of the Atomic Energy Act of 1954, as amended, the Export Administration Act, as amended and the Mutual Security Act of 1954.

Since the inception of the Atoms for Peace Program, the U.S. has supported the concept of international safeguards against diversion of nuclear materials from peaceful nuclear activities. Prior to the establishment of an International Atomic Energy Agency* (IAEA) safeguards system, the U.S. implemented bilateral

* An agency under the aegis of the United Nations.

safeguards under its Agreements for Cooperation. It was our view that internationally administered safeguards were more credible to the world at large than bilateral controls and prospectively more efficient than a series of duplicative bilateral controls applied by differing suppliers. Accordingly, with the advent of the IAEA safeguards system, the bilateral safeguard rights accorded to the U.S. were suspended in favor of IAEA controls. Under the terms of our agreements, our bilateral safeguards are suspended so long as IAEA safeguards are effectively applied. Moreover, the U.S. supported the development of the safeguards system of EURATOM. The IAEA and EURATOM systems have adopted a number of the U.S. ideas, procedures, and techniques directly, and perhaps of greater importance, the U.S. safeguards philosophy has molded the thoughts and attitudes of others with regard to international safeguards.

The objective of IAEA safeguards is the prevention of national diversion of nuclear material from peaceful application by the risk of early detection. In this effort, the IAEA relies heavily, but by no means exclusively, on existing national control systems to generate information for transmittal to IAEA. The major elements of the IAEA system are (a) material accountancy, (b) containment and (c) surveillance. The basic principle of the IAEA system lies in a comparison of information provided by

the country being inspected and the verification observation provided by the Agency. IAEA inspectors are accorded extensive opportunities to physically inspect and take independent measurements at safeguarded facilities, and their intensity of access increases with the strategic value of the nuclear materials at given locations. The system has undergone periodic upgrading and was extensively revised in 1970 to reflect the major new responsibilities the IAEA has assumed under the Treaty on the Non-Proliferation of Nuclear Weapons. Should a diversion be detected, specific penalties are possible including suspension of IAEA membership, disclosure of the diversion to the UN Security Council and General Assembly, and censure by the international community. The IAEA system does not in itself allow for direct intervention for the prevention of diversion by terrorist or dissident groups. The latter threats are addressed by the national safeguards and physical security systems of the IAEA member states. The U.S. is hopeful, however, that the IAEA will serve to stimulate an upgrading of national systems to assure that they keep pace with the growing availability of plutonium in many countries as well as the concerns that have been expressed about possible subnational threats and diversions. For its own part, and with the increase of terrorist activities worldwide, the U.S. recently has strengthened its own domestic physical security measures to prevent any

possible malevolent acts, however remote, in the nuclear field. Moreover, by working cooperatively in this field with the IAEA and other countries, the U.S. is encouraging a general upgrading of physical security precautions throughout the world.

Both safeguards and physical security measures are discussed herein. The term "safeguards" is used in this study in its broadest sense comprising all activities involving control and accounting measures necessary to detect and/or deter national diversion of materials and all activities necessary to prevent the subnational theft, diversion, or sabotage of materials or equipment.

The body of the attached report describes our export controls and international and domestic safeguards programs in substantially greater detail. Much attention is devoted to a detailed procedural description of applicable rules, regulations, and practices that pertain in these areas.

To place this analysis in perspective, however, some important general observations should be made at the outset.

First, it should be noted that the technical safeguards and export controls that exist are not the only significant measures the

United States and other countries have fostered over the past three decades to deter the spread of nuclear weapons. On the contrary, they constitute only one important component in a broad fabrication of U.S. policy which has been supported by every Administration and every Congress since the advent of the nuclear age. In particular, the U.S. has consistently made it clear to other nations that its civilian nuclear assistance can only be used for peaceful purposes and that the diversion of our materials for use in any nuclear explosive device would be a violation of our understandings.

Second, we have long perceived that we do not have a monopoly of scientific talent in the nuclear field and that even without our assistance other nations either would be able to develop nuclear capabilities on their own or through the assistance of other nuclear suppliers. These factors, together with the legitimate and growing interests that other nations have in nuclear power in the light of the energy crisis, have led us to conclude that we are more likely to deter proliferation by constructively associating ourselves with foreign programs in many countries than in remaining aloof.

Third, it should be stressed that our technical efforts in the field of safeguards, both internationally and domestically, are

reinforced by research and development programs in the U.S. and elsewhere designed to assure that safeguard techniques keep pace with the growing availability of plutonium worldwide. We are continuously endeavoring to devise techniques, new plant designs and scenarios designed to make controls more effective. It must be stressed, however, that no matter how promising a safeguard technique or system appears in theory, its true efficacy only will be as good as the willingness of sovereign states to participate, as well as the resources that are made available to support the system. Thus, both U.S. domestic efforts and our international efforts in the safeguards field will be defeated if they are encumbered due to serious shortages in funds and adequately trained manpower.

With these thoughts in mind, the following paragraphs describe the principal elements of our export and safeguards program, and a fuller description can be found in the main body of the report.

Export Control

The Atomic Energy Act of 1954, as amended, provides, inter alia, for the control of important commodities and technology used in atomic energy programs and for undertaking international cooperation in the peaceful uses of atomic energy. This dichotomy of purpose of the Act is reconciled in the U.S.

regulations and policies, particularly of the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC). The Executive Branch of the Government is involved in determining that actions are not inimical to the interests of the United States. National policy and national security implications are reviewed by the Department of State and ERDA and, as appropriate, other agencies and offices, including the Department of Defense and ACDA. Cooperation is effected by active participation in the IAEA and through intergovernmental Civil Agreements for Cooperation, which are approved by the President and reviewed by Congress. All U.S. action are taken in conformity with the Treaty on the Non-Proliferation of Nuclear Weapons, to which the U.S. is a party.

The Act controls the export of production and utilization facilities,* special nuclear material,* source material* and byproduct material.* Exports of special nuclear material (except special nuclear material exempted pursuant to subsection 54.b. of the Act) can be undertaken, and licenses for the export of production and utilization facilities be granted, only pursuant to an international agreement for cooperation and generally require specific export licenses from the Nuclear Regulatory Commission. Exports of source and byproduct material can be made only pursuant to such an international agreement and/or

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* See pages 22-25 for definitions.

upon determination that such an export would not be inimical to the interests of the United States or the common defense and security.

In addition, the Act and regulations promulgated by ERDA define conditions under which U.S. persons may directly or indirectly engage in the production of special nuclear materials outside of the United States. All nuclear activities in the Communist bloc which consitute "directly or indirectly engaging in the production of any special nuclear material outside the United States...", except those involving the transfer of unclassified, publicly-available information, require a specific determination and approval. The regulations provide a general authorization for the conduct of unclassified activities outside the Communist bloc except for those pertaining to the construction, fabrication, and operation of facilities for the (a) chemical processing of irradiated special nuclear material, (b) production of heavy water, and (c) separation of isotopes of uranium, or equipment or components especially designed for these facilities, and training foreign personnel in any of these activities. These latter require specific determination and approval by the Administrator of ERDA. Unclassified assistance to civilian nuclear power reactor and fuel fabrication projects is generally authorized but must be reported within 30 days; therefore, they can be withdrawn if it were determined to be in the interest of

the United States. Any classified activity may only be undertaken pursuant to an appropriate agreement for cooperation.

The export control authority of the Departments of Commerce (the Export Administration Act) and State (the Mutual Security Act of 1954) is applied to control the export of other nuclear-related items or technology not subject to the export jurisdiction of the Atomic Energy Act. License applications for these commodities receive further review within the Executive Branch.

It is believed that current laws provide ample authority to control the export and reexport of nuclear materials, and of supplies, articles, technical data or other information relating to the design, fabrication, development, supply, repair or replacement of any civil nuclear facility or any part thereof to prevent the proliferation of a nuclear capability for nonpeaceful purposes. While no additional legislative authority is required, existing policies and regulations are constantly being reexamined and changes to the regulations made as appropriate for the purpose of strenghtening export review and controls applied to nuclear materials and facilities. Civil agreements for cooperation are being strengthened by incorporating language expressly prohibiting the use of any U.S.-supplied special nuclear material, equipment or devices, and any special nuclear material produced through the use thereof, for any nuclear explosive device. Furthermore, exports of significant quantities

of strategic nuclear materials will not be approved unless the government of the recipient country has established a system of physical security measures acceptable to the United States.

The U.S. is, of course, only one of many nuclear suppliers and cannot unilaterally delay proliferation by controls on exports. There is no way to prevent an industrialized or semi-industrialized nation ultimately from developing a nuclear weapon program if it makes a determined effort to do so. Export controls can only delay such a program and increase its total cost in manpower and dollars. Therefore, major efforts are being made by the U.S. to gain universal acceptance of export control policies which will further inhibit proliferation. The U.S. is continuing to discuss with other nuclear suppliers the need for common supply policies aimed at assuring that nuclear assistance does not lead to proliferation. Important elements of such policies are requirements for safeguards of the International Atomic Energy Agency, adequate physical security measures, and guarantees against development and production of any nuclear explosives. The U.S., under existing laws, is able to implement such common policies and can modify existing regulations if and when necessary.

Safeguards

The rapid growth of the nuclear power industry, coupled with an increase in terrorist activities, has increased concern over diversion or theft of nuclear materials, sabotage of nuclear facilities or other acts of terrorism. The possibilities of sabotage, radioactive contamination threats, and armed attacks must be, and are being, weighed in the continuing process of threat assessment and establishment of appropriate countermeasures.

The low enriched uranium presently involved in the fuel cycle for light water reactors is not directly useable for nuclear explosives. On the other hand, highly enriched uranium (which is used in some test and research reactors and in high temperature gas-cooled reactors) and plutonium (which may be used in mixed-oxide fuel for light water reactors and in fast breeder reactors, and is produced in light water reactors) are useable for nuclear explosives.

Since the increase of international terrorist incidents, various panels and groups have conducted studies to assess the ability of preventative measures to repel attacks on any phase of the U.S. nuclear industry. These assessments are discussed in Annex A.

Determining the threat and improving safeguards measures have been given high priority. As a result of these efforts, the material control and accounting systems of ERDA and NRC have been strengthened. As noted earlier, physical protection measures are undergoing a major upgrading, which has been under way for the last two years. Both the safeguards and physical security systems, however, must continue to evolve with the changing technological, social, and political environment.

There are a number of areas in the nuclear fuel cycle that present special and unique safeguards concerns such as enrichment, fuel fabrication, and chemical reprocessing; the plutonium recycle program; high temperature gas-cooled and breeder reactor programs; radioactive storage areas and transportation of nuclear materials. Major efforts are underway in the U.S., in other nuclear supplier nations, and in the IAEA to develop and implement improved systems for the entire nuclear fuel cycle.

It is our considered judgment that domestic safeguards need to be kept under continuing review for the purpose of strengthening them. Measures to strengthen safeguards are now under development. In the future, additional safeguard measures will be required as the volume of materials grows and the technical complexities of facilities increase.

Based on our experience with IAEA accountancy safeguards, it is our judgment that the system will detect and thus make an important contribution to deterring any efforts at diversion by States. We also believe that as the volume of materials and the nature of facilities elsewhere in the world grow in their technical complexities, improvements in the equipment, staffing, and frequency of inspection and funding of the IAEA system are and will continue to be needed. A high level of U.S. financial, diplomatic, and technical support will be necessary.

With respect to subnational thefts, sabotage and terrorism, improvements are needed in most national systems which complement and are an essential element of the IAEA system. The principal improvement needed is to establish adequate physical security in those States which do not already have such systems. The U.S. is encouraging the strengthening of physical security measures in other countries by supporting the adoption of an international convention on this problem and by aiding and supporting IAEA safeguard development efforts.

The U.S. has been in the forefront of nations working toward the adoption of adequate international physical security measures. As an example, we recently have begun to include a requirement for mutual agreement on the physical security measures to be applied under our bilateral agreements for cooperation. We maintain an active research and development program to develop up-to-date techniques and equipment designed to cope with all types of possible threats while minimizing disruption of the essentially commercial character of the nuclear power industry. We are exchanging technical information in this area with other nations and with the IAEA.

Other nations have reached the technical level which permits them to compete effectively with the U.S. in selling nuclear reactors and equipment throughout the world. This country must cooperate closely with these other supplier nations to avoid a competition which would be based on minimizing the safeguards applicable to purchaser nations. Thus, it is necessary to convince the supplier nations that it is in their interest to assure that the proper safeguards and physical security measures are placed on all sales of nuclear material and equipment so that all nations may have an assurance that such materials and equipment will not be diverted to nonpeaceful purposes or fall into unauthorized hands.

The U.S. is taking the lead in supporting a major effort in the IAEA to improve its international safeguards system and to strengthen the recommendations for the physical security of nuclear material developed under the auspices of the Agency and published in March 1972. Such measures should provide restraints against terrorist groups who may attempt to gain control of such material. Adoption of such measures on an international scale would significantly reduce the risk associated with the potential threat to the sensitive areas of the nuclear fuel cycle (i.e., chemical reprocessing, fuel fabrication of highly enriched uranium and plutonium, and transportation.) Continued U.S. efforts in this area are vital.

The efforts required to continue to upgrade safeguards and physical security measures will require significant additional funding and technical efforts in both the U.S. domestic program and in the U.S. support of the IAEA.

B. INTRODUCTION AND BACKGROUND

The Atomic Energy Act of 1954, as amended, sets forth the primary legal basis for controlling important materials, equipment and technologies used in atomic energy programs. The provisions of this Act reflect not only stringent controls over these commodities and data, but also the means to undertake peaceful cooperation in the atomic energy field with other nations.

Under the stimulation of its own development of the atomic bomb and the belief that the possession of this technology was an American monopoly, the U.S. initially tried to bring about an international renunciation of the ownership and use of nuclear weapons under a system of international ownership and control. Concurrently, the United States enacted legislation in 1946 instituting a stringent system of secrecy and control which essentially barred peaceful international cooperation, pending broader international agreement on the control of nuclear weapons.

In the period from 1946 to 1953, several developments took place which resulted in a modification of this policy. First, a number of other countries established independent national atomic energy programs ranging from modest scientific undertakings to full-scale production. By the end of 1953 the Soviet Union

had achieved a thermonuclear weapons capability and substantial atomic energy programs were in being in Canada, France, and the United Kingdom. This suggested that continued secrecy might be unrealistic and counter-productive insofar as the peaceful uses of atomic energy were concerned, since the U.S. (through a policy of nuclear isolation) might lose opportunities to orient foreign programs to beneficial uses. Second, it proved impossible to achieve agreement with the USSR on the subject of atomic weapons control. Third, there was a growing expectation in the United States that the civilian application of atomic energy would in time be of great value in improving man's standards of living and that the U.S. was under moral and political obligations to share the benefits of this technology with cooperating nations. Fourth, a stage had been reached where less-advanced nations were tending to look elsewhere (e.g., USSR) for assistance, and U.S. prestige as a world leader in atomic energy development was at stake. It was felt that if the U.S. were able to assist foreign atomic energy programs, we would then be in a position to follow these activities, to receive information on their technological developments, and to obtain guarantees and safeguards rights. Fifth, it was felt that by encouraging the redirection of military materials to peaceful uses under a system of international

safeguards, we might establish a new common ground with the USSR and also hasten, in time, the adoption of broader disarmament measures.

As a result of these considerations, the U.S. conceived a new policy at the end of 1953 aimed at redirecting the use of atomic materials from military to civil programs and sharing the benefits of peaceful uses of atomic energy with other countries. This policy was announced by President Eisenhower in his speech to the United Nations General Assembly on December 8, 1953, when he proposed an Atoms for Peace Program and the establishment of an International Atomic Energy Agency. He also proposed that the major atomic powers cooperate and diminish the potential destructive power of their atomic stockpiles by making joint contributions of fissionable materials to this Agency. The Congress shared the Administration's views that the atom had moved us into a new era of peaceful significance and enacted the Atomic Energy Act of 1954, which provided, for the first time, the mechanism for a new and broad program of international cooperation in areas relating to the peaceful as well as the military uses of atomic energy.

As specified in Section 14 of the Export Administration Amendments of 1974, this report further reviews the domestic and

international safeguards measures and reports on the adequacy of such measures to prevent the proliferation, diversion, or theft of nuclear materials. As used herein, the term "safeguards" is used in its broadest sense comprising all activities involving control and accounting measures necessary to detect and/or deter national diversion of materials (safeguards) and all activities necessary to prevent the subnational theft, diversion or sabotage of materials or equipment in civil nuclear programs (physical security).

There is a continuing need to ascertain the adequacy of U.S. and internationally administered safeguards, partly because of the rapid world-wide growth of the number of reactors and of nuclear materials stockpiles of a rapidly growing nuclear power industry. The present industry deals mostly with low enriched uranium with only a few facilities having significant quantities of special nuclear material (separated plutonium, highly enriched uranium* and uranium-233). In this decade, the amount of special nuclear material in commercial activities will increase to many thousands of kilograms and is expected to increase to hundreds of thousands in the decades beyond. The materials are processed in complex plants having inventories of up to several tons and are transported in quantities up to

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* Uranium enriched in the isotope U-233 or in the isotope U-235.

a quarter-ton per shipment. The number of reactors world-wide is projected to reach 500-600 by 1990. Fuel fabrication and reprocessing facilities will also expand substantially.

The adequacy of safeguards against diversion, theft, or sabotage has become increasingly important since a few tens of kilograms of plutonium, uranium-233, or uranium-235 are enough for one or more nuclear explosive devices. Since plutonium is highly radiotoxic, it could also be used in quantities of less than one kilogram as a contamination or health threat.

C. LAWS AND REGULATIONS GOVERNING THE EXPORT OF COMMODITIES AND INFORMATION RELATING TO NUCLEAR FACILITIES

The Atomic Energy Act of 1954, as amended, prescribes controls, among other things, over production and utilization facilities; source, byproduct, and special nuclear material; activities, classified or unclassified, which constitute directly or indirectly engaging in the production of special nuclear material (SNM) outside the U.S.; and use or transfer of Restricted Data. The Atomic Energy Commission (AEC) was abolished in January 1975, with its responsibilities assigned to the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC).

Following are relevant terms as defined in the Atomic Energy Act:

Production facility, as defined in Section 11 of the Act, means (1) any equipment or device determined by rule of the [Atomic Energy] Commission to be capable of the production of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device as may be determined in accordance with the Act. Regulations at 10 CFR §50.2.(a) further define a "production facility" as (1) any nuclear reactor designed or used primarily

for the formation of plutonium or uranium-233; or (2) any facility designed or used for the separation of the isotopes of uranium or the isotopes of plutonium; or (3) any facility designed or used for the processing of irradiated materials containing special nuclear material.

Utilization facility, as defined in Section 11.cc. of the Act means (1) any equipment or device except an atomic weapon determined in accordance with the Act to be capable of making use of SNM in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public, or peculiarly adapted for making use of atomic energy in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device as may be determined in accordance with the Act. 10 CFR §50.2(b) of the regulations further defines a "utilization facility" as any nuclear reactor other than one designed or used primarily for the formation of plutonium or uranium-233.

Source Material, as defined in Section 11 of the Act, means uranium, thorium, or any other material which is

determined in accordance with the Act to be source material or ores containing one or more of the foregoing materials in such concentration as may be determined by regulation from time to time. 10 CFR §40.4(h) further defines "source material" as (1) uranium or thorium, or any combination thereof, in any physical or chemical form, or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of (i) uranium, (ii) thorium, or (iii) any combination thereof. Source material does not include "special nuclear material".

Byproduct material, as defined in Section 11.e. of the Act, means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material. The same definition appears at 10 CFR §30.4(d).

Special nuclear material*, as defined in Section 11.aa of the Act, means plutonium, uranium enriched in the isotope U-233 or in the isotope U-235, any other material which may in accordance with the Act be determined to be special nuclear material, or any material artifically enriched by any of the foregoing, but does not include source material. The AEC has not determined that any materials other than U-233, U-235

* Commonly abbreviated as SNM.

an all isotopes of plutonium are special nuclear material (10 CFR §70.4(m)).

Restricted Data (Section 11 of the Act) means all data concerning (1) design, manufacture or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy but not including data declassified or removed from the Restricted Data category. When Restricted Data can be published "without undue risk to the common defense and security", it may be removed from the Restricted Data category pursuant to Section 142 of the Act.

Applicable Laws and Regulations

Pursuant to Section 123 of the Act, the export of civil production and utilization facilities may be licensed only pursuant to the terms of an Agreement for Cooperation, as defined in Section 11.b. of the Act, and Restricted Data may be communicated abroad only pursuant to such an Agreement for Cooperation (Section 144 of the Act). Special nuclear material may, with the exception of such material exempted* from this requirement pursuant to Section 54.b. of the Act, be distributed abroad or licensed for export only pursuant to an Agreement for Cooperation.

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* PL 93-377 permits the export of SNM in quantities or for classes of uses or users that are exempted pursuant to Section 57.d. as amended by PL 93-377, and any quantity of plutonium containing 80 percent or more by weight of plutonium-238, other than under an agreement for cooperation.

Section 123 of the Atomic Energy Act requires that Agreements for Cooperation contain, among other things, (a) a guaranty by the cooperating party that security safeguards and standards as set forth in the Agreement will be maintained, (b) except for agreements in the military uses of atomic energy, a guaranty by the cooperating party that any material "will not be used for atomic weapons, or for research on or development of atomic weapons or for any other military purpose," and (c) a guaranty that any material or Restricted Data made available under the Agreement will not be transferred to unauthorized persons or beyond the jurisdiction of the cooperating party except as the Agreement may provide. All Agreements for Cooperation must be approved by the President who is required to authorize their execution and determine in writing that performance of the Agreement "will promote and will not constitute an unreasonable risk to the common defense and security." Thereafter, depending on the extent of cooperation to be undertaken, civil Agreements for Cooperation must lie before either the Joint Committee on Atomic Energy for thirty days or before the Congress for sixty days while Congress is in session before they may be brought into effect. Agreements involving significant cooperative activities may be prevented from being brought into effect if the Congress, by Concurrent Resolution, expresses its disapproval of the proposed agreement during the sixty day waiting period.

Source and byproduct material may be distributed abroad either pursuant to an Agreement for Cooperation and/or upon a statutory determination as provided in Sections 64 and 82.b. of the Act. The AEC has made a number of such determinations to permit issuances of general licenses covering exports of source and byproduct materials in 10 CFR Part 30, and 10 CFR Part 40.

Section 57.b. of the Act prohibits any "person" (defined in Section 11 of the Act) from directly or indirectly engaging in the production of any special nuclear material outside the United States except (1) under an Agreement for Cooperation made pursuant to Section 123, or (2) upon authorization by the [Atomic Energy] Commission after a determination that such activity will not be inimical to the interest of the United States. This prohibition extends to activities associated with the furnishing of plant and equipment as well as the furnishing of atomic energy related information to foreign recipients or for use abroad. 10 CFR §110 implements the provisions of Section 57.b. of the Act. Section 110.7 of the regulations sets forth a general authorization to engage in those activities prohibited by Section 57.b. of the Act outside the Communist bloc,* subject to certain exceptions.

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* Title 10 CFR §110 lists those countries and areas comprising the bloc as used herein - See Annex C.

Outside the Communist bloc, the general authorization specifically excludes activities pertaining to the design, construction, fabrication, and operation of facilities for the (a) chemical processing of irradiated special nuclear material, (b) production of heavy water, and (c) separation of isotopes of uranium, or equipment or components especially designed for any of these facilities. These activities require specific authorization if undertaken anywhere outside the U.S. Included in this general authorization outside the Communist bloc are activities which permit the export of civilian nuclear power reactor technology and assistance. Significant activities generally authorized under this regulation must be reported to ERDA within 30 days; therefore, such activities may be monitored. If these activities begin to involve international cooperation not in our national interest, we are in a position to control them by changing the regulations.

At present, the regulations themselves do not prohibit the retransfer by the foreign recipient of either the nuclear power reactor technology exported pursuant to the general authorization or the transfer of products derived from such

technology. U.S. persons, however, could not lawfully transmit such technology pursuant to this general authorization to non-Communist bloc destinations if they had knowledge or forethought that the technology was ultimately destined to the Communist bloc. Our present regulations rely on the commercial interests of U.S. companies to extract non-retransfer provisions in any contractual arrangements entered into for the transfer of U.S.-origin reactor technical data. In addition, NPT parties would be precluded from exporting certain reactor components to Non-Nuclear Weapons States unless the material used or produced in the facilities involved are subject to safeguards, and COCOM participating countries would be prohibited from exporting either the technology or the reactor components to bloc countries unless unanimously agreed by all COCOM participating countries, including the U.S.

Exports of nuclear reactors or nuclear fuel would still require specific export licensing notwithstanding the general authorization set forth in 10 CFR Part 110, thus providing a further control on certain activities involving foreign civil nuclear power reactors. With regard to Communist bloc countries, all activities of the nature controlled by Section 57.b. are prohibited except the furnishing of information

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* COCOM is a group of nations consisting of the NATO countries, less Iceland, plus Japan, that have agreed to embargo certain strategic items to the Communist bloc.

which is available to the public in published form or which will be made available to the public in published form within 60 days after the furnishing thereof, and activities limited to participation in meetings or conferences of a specified nature or exchange programs approved by the Department of State.

Pursuant to these laws and regulations, and where applicable, the appropriate agreement for cooperation, the Nuclear Regulatory Commission may issue licenses for export of production facilities, utilization facilities, source, byproduct and SNM. When the export license application is considered complete, NRC issues an export license with appropriate special conditions, including transportation and safeguards conditions, as applicable, placed on the license for the information of the licensee and the Bureau of Customs inspectors. The licensee must present the original license to the Bureau of Customs office at the port of exit from the U.S., with the licensed shipment or any portion thereof. Copies of issued licenses are sent to the licensee, the NRC public document room, the radiation control agency of the state in which the licensee is located, and, if appropriate, to the International Atomic Energy Agency.

In the case of a utilization facility export license application, a notice of receipt of application is published in the Federal

Register advising the public that they have fifteen days to ask for a hearing or to submit a petition to intervene to the Nuclear Regulatory Commission. Also, the Joint Committee on Atomic Energy (JCAE) is advised that NRC has received and is considering an application to export a utilization facility. Distribution of issued export licenses for utilization facilities is as indicated above, with the additional notification of issuance sent to JCAE and to the Federal Register for publication.

Pursuant to the Export Administration Act of 1969, as amended, (50 U.S.C. App. Sections 2401 et. seq.) and implementing regulations (Title 15 CFR, Parts 368-399), the Office of Export Administration, U.S. Department of Commerce, licenses the export of nuclear reactor equipment and components not constituting a utilization facility, and certain materials unique to the fabrication and operation of nuclear reactors, such as zirconium, hafnium, graphite, and heavy water. In addition, Commerce's export regulations include export coverage over certain significant specially designed items used in those facilities which, as complete facilities, could only be authorized for export pursuant to the Atomic Energy Act of 1954, as amended. This redundancy in

export coverage results from Commerce's responsibility to fulfill U.S. obligations in implementing international COCOM embargo controls (and all of these items are on the COCOM embargo list) and ERDA efforts to ensure that the stringent controls over these significant items are widely publicized to the export community. Commerce cooperates with ERDA in referring applications made to the Department of Commerce for the export of these nuclear related items for review and comment prior to any action being taken by the Commerce Department on the export license. Depending on the circumstances and the item sought to be exported, ERDA concurrence is given orally or in writing.

In view of the close relationship between maritime and naval nuclear propulsion technologies, a validated export license application must be obtained from the Department of Commerce before any United States firm or individual may disclose any technology in connection with a foreign maritime nuclear propulsion project. This technology includes any technical data related to maritime nuclear propulsion plants, their land prototypes, and special facilities for their construction, support, or maintenance, including any machinery, devices,

components, or equipment specifically developed or designed for use in such plants or facilities. Applications made to the Department of Commerce for the export of these items are referred to ERDA, DOD and State for review and appropriate action before any action is taken by the Commerce Department on the proposed export. This control was initiated to insure that U.S. naval nuclear propulsion technology is not inadvertently exported in connection with a civil maritime nuclear propulsion project. U.S. naval propulsion technology, classified or unclassified, is by U.S. national policy not releasable to foreign nationals or foreign governments unless such release is authorized under an Agreement for Cooperation for Mutual Defense Purposes concluded pursuant to the Atomic Energy Act of 1954, as amended.

The Atomic Energy Act establishes even more stringent requirements for cooperation in the military applications of atomic energy with foreign countries. Section 91 of the Act sets forth conditions applicable to international cooperation involving military uses of (a) source material, (b) byproduct material, (c) special nuclear material, (d) utilization facilities, (e) non-nuclear parts of atomic weapons, (f) non-nuclear parts of atomic weapons systems involving Restricted Data, or (g) Restricted Data. Among

other things, such cooperation must be undertaken pursuant to the terms of an agreement for cooperation.

Agreements for Cooperation for mutual defense purposes are subject to certain conditions not applicable to civil agreements. For example, Section 91.c of the Act requires that the cooperating party is participating with the United States in "an international arrangement" for mutual defense and security. It also requires that the President approve the program of cooperation contemplated under the Agreement, that he make a determination in writing that the proposed cooperation and each of certain proposed transfer arrangements will promote and will not constitute an unreasonable risk to the common defense and security. The Agreement must lie before Congress for sixty days while Congress is in session and may become effective only if the Congress does not pass a Concurrent Resolution during that period stating in substance that it does not favor the proposed Agreement. This waiting period may only be waived by an Act of Congress.

Pursuant to Executive Order 10841, the President has delegated to the Atomic Energy Commission and the Secretary of Defense

acting jointly the authority to make determinations that specific transfer arrangements will promote and will not constitute an unreasonable risk to the common defense and security.

Applicable U.S. Policies

In addition to the statutory controls imposed by the Atomic Energy Act, the Export Administration Act, and the Mutual Security Act of 1954, as amended, (from which the International Traffic in Arms Regulations derives authority), the U.S. has long followed a policy of limiting the spread of nuclear weapons. A keystone of that policy has been the inclusion in all civil Agreements for Cooperation of a requirement that safeguards must be applied with respect to all material, equipment or facilities exported or re-exported pursuant to the Agreement, and special nuclear material used in or produced therefrom.

Policies evolving from U.S. treaty commitments under the Treaty on the Non-Proliferation of Nuclear Weapons further reinforce non-proliferation objectives by requiring that equipment or material especially designed or prepared for the processing, use or production of special fissionable material not be exported to any Non-Nuclear Weapon State unless the nuclear material is subject to safeguards. In implementating these policies, ERDA monitors applications filed with the

Office of Export Administration, Department of Commerce, in addition to those previously noted, for the export of certain identified general purpose commodities that could be used either in a program for the production of SNM or the development of nuclear weapons or nuclear explosive devices. This procedure began in 1947, following the enactment of the Atomic Energy Act of 1946, when it became apparent that although the AEC had statutory authority to control any important component parts specially designed for such equipment or devices, there were a number of materials and equipment of a general purpose nature which it did not have authority to control which could make an important contribution to a military atomic energy program. In October 1947, the Secretary of Commerce offered to assist the AEC in regulating these nuclear related items by using Commerce's authority under the Export Control Act. This led to the inclusion of many items on the Commerce Positive List, and the establishment of review procedures by AEC of Commerce export license applications involving the identical equipment and material. Since that time, the list of commodities, which subsequently became known as the AEC Referral List, has been revised periodically to reflect those commodities of primary importance if used in furtherance of military nuclear programs.

Adequacy of Current Laws and Regulations

Current laws provide authority to control the export and reexport of nuclear materials, and of supplies, articles, technical data or other information relating to the design, fabrication, development, supply, repair or replacement of any civil nuclear facility* or any part thereof to prevent the proliferation of a nuclear capability for nonpeaceful purposes.

A difficult issue in using the export control mechanism to achieve non-proliferation objectives is the balancing of these security objectives with the objectives of encouraging trade, as called for by the Export Administration Act, and the dissemination of scientific and technical information in atomic energy "so as to provide that free interchange of ideas and criticism which is essential to scientific and industrial progress and public understanding...." as called for by the Atomic Energy Act.

While no additional legislative authority is required, existing policies and regulations are constantly being reexamined and changes to the regulations made as appropriate for the purpose

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* See Annex B for further discussion regarding nuclear facilities.

of strengthening export review and controls applied to nuclear materials and facilities. Civil Agreements for Cooperation are being strengthened by incorporating language expressly prohibiting the use of any U.S.-supplied special nuclear material, equipment or devices, and any special nuclear material produced through the use thereof, for any nuclear explosive device. This is in addition to the standard guarantee prohibiting the use of such material or equipment for atomic weapons, for research in or development of atomic weapons, or for any other military purpose, and is intended to clarify and confirm our long-established policy against such use. Other restraints under consideration include a discretionary U.S. right of approval over the location of facilities for the reprocessing and storage of reactor fuel. Further, exports of significant quantities of strategic nuclear materials will not be approved unless the Government of the recipient country has established a system of physical security measures acceptable to the United States.

The U.S. is, of course, only one of many nuclear suppliers and cannot unilaterally delay proliferation by controls on exports. There is no way to prevent an industrialized or semi-industrialized nation ultimately from developing a nuclear

weapon program if it makes a determined effort to do so. Export controls can only delay such a program and increase its total cost in manpower and dollars. Therefore, major efforts are being made by the U.S. to gain universal acceptance of export control policies which will further inhibit proliferation.

Approaches are being made to other nuclear supplier nations to seek agreement on strengthening and standardizing controls on exports. Such efforts include requiring adequate physical security measures, common non-proliferation policies in such areas as technology transfer, retransfer prohibitions, special conditions for assistance in enrichemnt and reprocessing and a guarantee against the development and production of any nuclear explosives. In view of its commitment under the Treaty on the Non-Proliferation of Nuclear Weapons, the U.S. Government has joined with other nuclear suppliers in designating items of equipment and material especially designed or prepared for the processing, use or production of special fissionable material which may not be exported without triggering the applications of IAEA safeguards.

D. DOMESTIC NUCLEAR SAFEGUARDS

1. Current Regulations and Guides

As a matter of ERDA and NRC policy, the control measures imposed on plants and transportation of ERDA license-exempt contractors and of NRC licensees are either the same or comparable. Details for licensees are discussed generally in the following.

Issuance of licenses to possess special nuclear material under the provisions of the Atomic Energy Act of 1954, as amended, requires a finding that the proposed activity will not be "inimical to the common defense and security" and will not constitute "an unreasonable risk to the health and safety of the public." Furthermore, regulations authorize the Nuclear Regulatory Commission to incorporate in any license additional conditions and requirements that might be appropriate to guard against loss or diversion of special nuclear materials. Although this continues to be the case, the main structure of safeguards conditions for licensee requirements are now contained in Title 10, Chapter 1, of the Code of Federal Regulations (10 CFR) as required by the Atomic Energy Act of 1954, as amended. Each licensee is required to permit the NRC to inspect "upon reasonable notice" in such manner as appropriate for the NRC to administer its regulations.

License-exempt contract operations are controlled by the provisions of AEC Manual chapters which specify conditions of operation and transportation. As conditions change, the Manual chapters are modified as appropriate.

Civil and criminal penalties for safeguards violations have been provided for, as well as rewards for information concerning unauthorized manufacture or acquisition in the U.S. of special nuclear material and atomic weapons. The Atomic Energy Act of 1954, as amended, prescribes the following criminal penalties:

- Fine of up to $10,000 or imprisonment of up to ten years, or both, for wilfully engaging in unlicensed activities with special nuclear material,
- Fine of up to $20,000 and life imprisonment, or both for the same if the intent is to injure the United States or to obtain advantage for a foreign nation.

The same penalties apply to the unlawful possession or manufacture of an atomic weapon. A later revision of the Atomic Energy Act added the following civil penalties:

- Fine of up to $5,000 for each violation, with a maximum of $25,000 for all violations within any 30-day period of licensing requirements of the Act, license conditions, licensing regulations, or order issued thereunder.

The Atomic Energy Rewards Act of 1955 (Public Law 84-165), which was later expanded to the Atomic Weapons and Special Nuclear Materials Rewards Act (Public Law 93-377), provides for the payment of up to $500,000 to any person furnishing information leading to the discovery of any special nuclear material or atomic weapon unlawfully located within the United States.

Safeguards Objectives and Program Elements

Safeguards measures are designed to deter, prevent, or respond to (1) the unauthorized possession or use of significant quantities of nuclear materials through theft or diversion and (2) sabotage of nuclear facilities. The safeguards program has as its objective achieving a level of protection against such acts to ensure against significant increase in the overall risk of death, injury, or property damage to the public from other causes beyond the control of the individual.

The program includes the following functional elements:

(1) Definition of the nature and dimensions of the threat.

(2) Development and imposition on the nuclear industry and contractors of safeguards requirements directed toward countering the threat.

(3) Licensing activities, including review of safeguards procedures proposed by nuclear industry and contractor applicants, as required by regulations.

(4) Inspection of safeguard implementation to ensure adequacy.

(5) Enforcement of requirements through administrative, civil, or criminal penalties.

(6) Administrative and technical support for response and recovery.

(7) Development and testing of methods, techniques, and equipment necessary to the effective implementation of safeguards.

(8) Frequent program review in the light of industrial/technical or social/political changes to assure that any needed changes are made in the program elements above.

Current programs are directed at protecting against theft or diversion of types and quantities of nuclear materials that could be used for nuclear explosives or contaminants and protecting against sabotage of nuclear facilities containing such materials. The present requirements are designed to protect against theft, diversion, or sabotage by one or two employees with access to the plant and material, by a small armed force attacking a plant or vehicle, or by both acting in combination. The approach to development of safeguards requirements is to provide "protection in depth," that is, to provide multiple opportunities to interrupt adversary action sequences.

Licensing Activities

Title 10 of the Code of Federal Regulations, Part 70, requires licenses in order to own, acquire, deliver, receive, possess, use, transport, import, or export special nuclear materials. The NRC publishes specific safeguards requirements for materials and plant protection in 10 CFR Parts 70 and 73 and carries out the following activities to assure compliance: (1) prelicensing evaluation of certain license applicant's proposed nuclear activities, including safeguards procedures in the case of applicants for significant quantities of special nuclear material; (2) issuance of a license to authorize certain activities subject to specific safeguards requirements; and (3) inspection and enforcement to assure that applicable safeguards requirements are met by implementation of approved plans.

In the pre-licensing review, information submitted by the applicant is reviewed. This includes: the applicant's technical qualifications; a description of the process, equipment, and facilities to be used; the material control and accounting program, including measurement performance capability; and the physical security program. Details of the material control and accounting program and the physical security program are withheld from public disclosure, as is specified in paragraph 2.790(d) 10 CFR§2.

The pre-licensing review also includes consideration of other aspects of the facility design and operation. Full account is taken of the interrelated effects of safety requirements and of the inherent features of the facility that contribute to the protection afforded by the safeguards system. For example, the requirements that special nuclear materials be safely contained during normal operation, operational accidents, and earthquakes and tornadoes, as well as requirements for shielding and safe shutdown in the event of mal-operation, result in the incorporation of substantial physical containment structures, shutdown systems, and personnel access limitations that in themselves enhance safeguards.

When a license is granted, each licensee must confine possession and use of special nuclear materials to the purposes and locations authorized in the license and may transfer nuclear materials only to an authorized recipient. The licensee must also comply with the detailed accountability and physical protection requirements of his particular license.

In regard to inspection and enforcement, the licensee is required to afford the NRC opportunity at all reasonable times to inspect special nuclear material and the premises and facilities where it is used, produced, or stored. In addition,

each licensee is required to make available for inspection any relevant records and to perform, or to permit the NRC to perform, any tests deemed necessary.

Physical Protection

Regulations have been promulgated for the physical protection of licensed installations authorized to possess or use 5 kilograms of U-235 (contained in uranium enriched to 20% or more), 2 kilograms of U-233, 2 kilograms of plutonium or a weighted combination of these.*

With regard to the protection of reactor facilities, regulations require a sabotage protection program to be submitted by the license applicant and approved by the Nuclear Regulatory Commission. A Regulatory Guide[1/] was published to assist in the development of adequate programs. The guide includes recommendations on control of material and personnel access to the plant site, selection and training of plant personnel, monitoring of plant equipment, and design and arrangement of plant features. Some of the specific criteria it includes are: on-site armed guards; two continuously manned alarm stations;

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* The regulations apply to a weighted combination of 5000 grams or more computed by the formula: grams = (grams contained U-235) + 2.5 (grams U-233 + grams plutonium).

1/ USAEC, "Protection of Nuclear Power Plants Against Industrial Sabotage", Regulatory Guide No. 1.17, Office of Regulation, Washington, D.C., June 1973.

two independent communication links with law enforcement authorities; specifications for intrusion alarms, emergency exit alarms, and line supervisory systems; equipment testing; and protection of vital equipment through design features including automatic indication of inoperability.

Nuclear power plants possess several inherent structural characteristics that would make intentional damage extremely difficult. Steel-lined, reinforced or prestressed concrete containment shells, which are capable of withstanding the effects of such events as jet aircraft impact, and steel pressure vessels containing the nuclear fuel, which in turn are surrounded by concrete shielding up to 8 ft. or more in thickness are examples of the measures employed. Much of the primary system is also in the below-grade regions of the containment building and is afforded additional protection by the surrounding earth. Additional features that provide protection against acts of sabotage, incorporated into typical plant designs for normal safety reasons, include missile shields, physical separation of vital engineering safety features, and duplication of essential electrical and mechanical systems. These features, together with conventional industrial security measures such as fencing and guards, collectively provide a significant measure of protection.

The requirements for facilities other than reactors specify that vital equipment or special nuclear materials be located within areas protected by barriers, which , in turn, are within a fenced or walled protected area. The space between the protected area fence and the inner barrier must be illuminated and monitored to detect abnormal presence or activities. Guards and watchmen must be trained and equipped and have communications with law enforcement authorities; access to protected and vital areas must be restricted; individuals authorized to enter such areas without escort must wear coded picture badges; and vehicles inside the protected area must be escorted. Persons and packages entering protected areas are searched (employees having AEC security clearance and packages other than hand-carried are searched at random). Upon entry into and exit from a material access area, all packages are searched, and all persons, packages, and vehicles are searched upon leaving. A Regulatory Guide[2/] has been issued on control of personnel access.

Material Control and Accountability

Design to provide assurance that material is always present at its designated proper locations, a properly functioning program of material accountability also acts as a deterrent

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2/ USAEC, "Control of Personnel Access to Protected Areas, Vital Areas, and Material Access Areas", Regulatory Guide No. 5.7, Office of Regulation, Washington, D.C., June 1973.

to theft. It includes preparation of detailed and current records on the form, quantity, and location of special nuclear materials and the completion of material balances based in physical inventories. In its general application, it includes various administrative and operational procedures directed at maintaining current knowledge of nuclear material quantity and location and detecting any removal of such material from authorized locations. Methods include documented transfer of custodial responsibility and, at some facilities, regular and frequent piece count by operating personnel.

Licensees authorized to possess at any one time and location more than one effective kilogram* in unsealed form are required to follow material control, accounting, and physical inventory procedures. Full descriptions of programs are required from licensees, including measurement quality, control systems within designated locations, areas for which accountancy will be maintained, and scrap control. The program should be adequate (1) to assure that the uncertainty of the material

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* "Effective kilograms of special nuclear material" means: (1) for plutonium and U-233 their weight in kilograms; (2) for uranium with an enrichment in the isotope U-235 of 0.01 (1%) and above, its element weight in kilograms multiplied by the square of its enrichment expressed as a decimal weight fraction; and (3) for uranium with an enrichment in the isotope U-235 below 0.01 (1%), by its element weight in kilograms multiplied by 0.0001.

balance is within prescribed limits,* and (2) to calculate material balances based on physical inventories at bimonthly intervals for plutonium (except for plutonium containing 80% or more by weight of Pu-238), for U-233, and for uranium enriched to 20% or more in the isotope U-235. Step (2) above is required at semiannual intervals for uranium enriched to less than 20% in the isotope U-235; for plutonium, U-233, and highly enriched uranium in that portion of an irradiated fuel reprocessing plant from the dissolver to the first vessel outside the shielded portion of the process; and for plutonium containing 80% or more by weight of the isotope Pu-238. Minimum standards have been stipulated for the quality of these material balances. Licensees authorized to possess from 350 grams up to one effective kilogram of contained U-235, U-233, plutonium, or any combination thereof are required to conduct physical inventories at least annually.

The material accountability programs need considerable upgrading. For example, it would be desirable to have more accurate and

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* Material unaccounted for (MUF) is the difference between the book inventory and the physical inventory. The measurement uncertainty of MUF can be estimated through statistical procedures. The range of measurement uncertainty expected for MUF is addressed as the limit of error of MUF (LEMUF). The value of MUF in relation to the LEMUF is used as an indicator of those material balance conditions which warrent evaluations to assure that diversion has not taken place. See Annex D for MUF and LEMUF requirements.

timelier data. In addition to their primary purpose, increased physical security measures are being used to provide timely detection of diversion which offsets in part the inadequacies in the current material accountability systems. As the volume of materials and complexity of systems grows, improved material accountability will be essential. Material accountability programs to assure more accurate and timelier data are needed. Emphasis is being given to this in the R&D safeguards efforts.

Special Nuclear Material in Transit

Safeguards requirements have been established for protecting special nuclear materials being moved between sites. Provisions in 10 CFR 73 include specific physical protection requirements that apply to licensees who ship five kilograms of U-235 (contained in uranium enriched to more than 20%), two kilograms of plutonium or U-233, or a weighted combination of these.

Truck shipments involving these quantities of material must be escorted by two armed guards in a separate vehicle unless the licensee uses a truck or trailer specially designed to protect against theft or diversion. Truck shipments must be made directly from the shipper to the consignee with no loading or unloading of other cargo between these points. Additional measures include: (1) communication every two hours by radiotelephone on board the truck (where radiotelephone coverage is not available, conventional telephone calls must be made when there has been no communication

for more than five hours); (2) marking of the top and sides of the truck with identifying letters or numbers; (3) use of preferential routing to avoid trouble areas; (4) continuous surveillance of truck transport, including the use of two persons on board; (5) preplanning shipments to assure delivery at a time when the receiver is available to accept the material; and (6) the use of locks and seals on vehicles and containers.

When rail transportation is used, the shipment must be escorted by two armed individuals in the shipment car or in an escort car of the train to keep the shipment cars under observation and to guard the shipment and check the car or container locks and seals when the train is stopped. Radiotelephone communication must be maintained with a licensee or his agent, backed up as needed by normal telephone communication at scheduled stops. All transfers must be monitored by armed personnel.

Regulation 10 CFR § 73 prohibits licensee shipments abroad passenger aircraft of more than 20 grams or 20 curies, whichever is less, of plutonium or U-233 and shipments of more than 350 grams of U-235 enriched to more than 20%. When cargo aircraft are used, the number of enroute transfers are to be minimized and are to be observed by armed monitoring personnel.

Shipments by sea must be made on vessels making minimum ports of call; and ship-to-shore contact must be made daily. No ship-to-ship transfers are permitted. Transfer to other

transport modes must be monitored by armed guards. The shipment must be kept in a sealed compartment that must be monitored during transfer of other cargo.

Importers are required to protect shipments in accordance with the requirements outlined above from the time the shipments arrive in this country.

Inspection

During operation of a licensed or contractor plant, the NRC or ERDA, respectively, conducts on-site inspections to assure continued effective implementation of material control requirements and protection plans. Each licensee is required to afford the NRC opportunity to inspect the nuclear materials and the premises and facilities where the materials are used, produced, or stored; to perform or permit the NRC to perform necessary tests of materials and equipment; and to make available any records pertaining to possession, use, or transfer of nuclear material. At license-exempt facilities, ERDA has full right of access at any time to inspect nuclear material, equipment and storage facilities, to make whatever tests of these which are advisable and to acquire and audit all records pertaining to protection, use and transfer of nuclear material.

Inspection strategies are directed at achieving objectives on a systematic basis, where the scope, frequency, and

intensity of inspection are determined primarily be considering: (1) strategic value of the special nuclear material, (2) the accessibility of the special nuclear material, and (3) safety significance.

Secondary, but important, modifying factors are: (1) prior inspection history of the facility, and (2) results of monitoring of facility records and reports, including material unaccounted for, shipper-receiver differences, and normal operational losses/measured discards.

Licensees are categorized into groups based on the quantity, strategic value and accessibility of special nuclear materials they are authorized to possess. Group description and minimum inspection and inventory verification frequency are established as follows:

Group I

A. Fuel facilities with material of high strategic importance authorized to possess more than 2 kilograms plutonium, uranium-233 and/or 5 kilograms U-235 (more than 20% enriched) in unsealed form shall be inspected three times per year with an inventory verification every two years.

B. Reprocessing plants shall be inspected monthly with an annual inventory verification.

Group II

Reactors with fuel of high strategic importance authorized to possess 2 kilograms plutonium, uranium-233, and/or 5 kilograms uranium-235 (more than 20% enriched) in sealed form shall have at least a biennial inspection with inventory and burn-up and/or production check.

Group III

Fuel facilities with material with moderate strategic importance authorized to possess 5000 kilograms uranium-235 contained in uranium enriched to less than 20% uranium-235 in any form other than Group IV shall have an annual inspection with triennial inventory verification.

Group IV

Power reactors with fuel of moderate strategic importance (less than 20%) shall have at least a triennial inspection with inventory and burn-up and/or production check.

Group V

Facilities with material with high strategic importance authorized to possess greater than 350 grams uranium-235*, uranium-233 and/or plutonium but less than 2 kilograms plutonium, uranium-233, and/or 5 kilograms uranium-235* in any form shall be inspected at least quadrennially with an inventory review.

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* More than 20% enriched

Group VI

Facilities authorized to possess 350 grams or less of special nuclear material have no routine inspection requirements.

Three different types of physical inspections of licensees are conducted: physical protection, material accountability, and inventory verification. The annual rate of these inspections for the various groups of licensees are shown in Table I.

Enforcement

If items of noncompliance or deficiencies are found in the implementation of safeguards requirements by the licensee, the licensee is instructed to take prompt corrective action and to inform the NRC of the results. The NRC has the authority to modify, suspend, or revoke licenses and to impose civil penalties on licensees for noncompliance with the items and conditions of their license. In the case of a discrepancy between the physical inventory results and the book records larger than a limit specified in regulations or permitted by license conditions, the entire facility or localized material balance areas would be shut down and reinventoried. Activity may not be resumed until problem areas are defined and corrected. Corrective action is required

TABLE I

MINIMUM ANNUAL NUMBER OF INSPECTIONS OF LICENSEES

Group	Facilities	Minimum Physical Protection	Material Accountability	Inventory Verification
I	Fuel Facilities, Material of high strategic importance	1	3*	0.5**
II	Reactors - Fuel of high strategic importance	1	0.5	0.5
III	Fuel Facilities, Material of moderate strategic importance	1	1	0.33
IV	Power Reactors, Fuel of moderate strategic importance	1	0.33	0.33

* - 12 inspections for Fuel Reprocessing Plants

** - Annual for Fuel Reprocessing Plants

immediately for manual chapter requirements that have not been adhered to. In case of noncompliance by an ERDA facility, the action depends upon the severity of the violation. Violators of the Atomic Energy Act or any regulation or order issued by NRC or ERDA may be guilty of a crime and, upon conviction, may be punished by fine or imprisonment or both as provided by law.

Procedures Involving Theft or Sabotage

Procedures exist for response to:

(1) any suspected or actual theft of SNM or other material which could present a radiological hazard;

(2) any threat of sabotage to a facility containing such materials;

(3) any threat involving the destructive use of such materials.

Response requirements for licensees toward threats are given in 10 CFR § 73.50g. Immediate measures must be taken to neutralize the threat, either by appropriate action by guards or by calling for assistance from local law enforcement authorities, or both.

Licensees are required to inform the NRC promptly, and will normally inform local law enforcement agencies, in the event of a suspected or actual theft or of a threat of sabotage.

Upon being informed of any of the foregoing circumstances, NRC and ERDA would promptly inform the FBI, which has statutory responsibility for investigating all such incidents. In addition, NRC and ERDA would support the FBI with specialized technical assistance, especially in connection with the recovery of stolen material and would undertake to determine whether there is a potential hazard of nuclear explosion or radiological danger. If a hazard is determined to exist, the various ERDA offices* responsible for implementing the established Radiological Assistance Plan would be alerted or activated. This plan provides for advice and assistance in the areas of emergency evacuation and rescue, radiation monitoring, decontamination, and specialized emergency medical services where personnel are exposed to radiation.

* Including, for example, the Headquarters Radiological Incident Center, the Joint Nuclear Accident Coordinating Center, the Aerial Radiological Measuring System, and the appropriate field offices.

2. Future Modifications Now Under Study or Planned to be Studied

Major new developments in the functioning of the nuclear industry can have considerable effect on the operation of safeguards and on the effectiveness of safeguards. Such developments for the near future include the possible use of mixed oxide fuels* for light water reactors (LWR), high-temperature gas-cooled reactors (HTGR), and liquid-metal fast breeder reactors (LMFBR) commercially. Each would significantly increase the amount of strategic materials (plutonium, highly enriched uranium, or uranium-233) in the nuclear fuel cycle. These projected[3/] annual uses of strategic materials for all non-weapon use (but including military propulsion uses) are shown in Table II.

Further, in the future, similar needs for safeguards evaluations might be needed for molten-salt breeder reactors, gas-cooled breeder reactors, and controlled thermonuclear reactors, but such needs are now uncertain.

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* Fuels containing recycled plutonium. Until reprocessing plants come into operation, no appreciable quantities of plutonium will be available for commercial nuclear power. The Barnwell plant is scheduled for July 1976 and West Valley for mid-1978.

3/ The "Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in LWR's", WASH-1327, USAEC, August 1974; Vol 4, Page V-8

Table II

ESTIMATED UTILIZATION OF STRATEGICALLY IMPORTANT SNM (KILOGRAMS)

			1974	1975	1976	1977	1978	1979	1980	1985	1990	1995	2000
Highly Enriched Uranium	HTGR	^{235}U / ^{233}U	100	200	200	200	800	1000	2000	14000	33000	55000	73000
	Others	^{235}U	7200	7400	6800	7000	5800	5900	6200	5600	5600	5600	5600
Pu Fissile - Other than Commercial Breeder & LWR Recycle*			600	1600	1700	1800	1900	2000	2700	2700	2700	2700	2700
Pu Fissile - Commercial Breeder			0	0	0	0	0	0	0	0	11400	65400	164300
Pu Fissile - Commercial LWR Recycle			0	0	400	2400	7000	6800	7900	26800	44300	47300	59100
Total Strategic SNM Except Pu Recycle			7900	9200	8700	9000	8500	8900	10900	22300	52700	128700	245600

*Includes R&D quantities of fissile Pu for FFTF, Demonstration LMFBR, Recycle in LWRs, etc.

Upgrading Regulations

Several proposed changes in regulations applying to licensees have been published for comment in the Federal Register, but have not yet been issued as regulations.

Transportation

In one proposed regulation[4/] transportation security would be substantially improved through more stringent minimum requirements. More guards are required, the number depending upon the use of secure vehicles, armored vehicles, and continual radio communications.

Power Reactor Security

Another proposed regulation[5/] would specify security measures for protecting power reactors against sabotage attempts. The regulation would require greater personnel control and searching and would require better physical security for vital areas, such as bullet-proof glass for control rooms. The general result would be substantially the same physical protection requirements for power reactors as now apply to fuel cycle facilities.

Design Information and Reprocessing Plants

This proposed regulation would require licensees to submit safeguards design information for reprocessing plants before construction permits are granted. The information would be concerned with safeguards requirements for sabotage, security, and accountancy.

4/ Federal Register, Vol 39, No. 220, Nov 13, 1974, p 40036.

5/ Federal Register, Vol 39, No. 220, Nov 13, 1974, p 40038

Possible Changes in Dissemination of Information

A government-wide study of the national security significance and international implications of the dissemination of safeguards information, including information on material unaccounted for (MUF), has been undertaken under the aegis of the National Security Council. The NRC will consider the results of that study in determining the appropriate manner for dealing with such information to the extent it may relate to reporting requirements for abnormal occurrences within the intent of section 208 of the Energy Reorganization Act of 1974.

Possible Clearance Program for Licensees

The AEC was given statutory authority to institute a clearance program for access to, or control over, special nuclear materials (Public Law 93-377). NRC is considering implementation of this program in the licensee sector.

3. Evaluation of a Domestic Safeguards System

The evaluation of any system includes three steps: First, a statement of the problem which the system is to address. Second, a statement of the objective of the program vis-a-vis the problem. Third, a determination of the means for evaluating the effectiveness in terms of the objective. The evaluation of effectiveness will indicate the extent to which the objective has been met.

The problem and objective of domestic safeguards has been given as:

> to achieve a level of protection against wilful actions involving the possession of nuclear materials or the sabotage of nuclear facilities to ensure against a significant increase in the risk of death, injury, or property damage to the public from other causes beyond the control of the individual.*

As indicated by this statement, the evaluation of effectiveness is in terms related to the total risk to the public from these acts.**

Death, injury, or property damage may result by wilful acts to cause a nuclear explosion, a critical incident, or a dispersal of nuclear material. The magnitude of the risk to the public from any of these events is the product of (a) the frequency at which attempts would be made to produce the event, (b) the likelihood that an adversary would be successful should he attempt to perpetrate the event, and (c) the consequences to the public should he be successful. Therefore, an acceptable level of protection can be approached by conducting activities which: (a) reduce the frequency of attempts to produce these societal consequences; (b) reduce the likelihood of adversary

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* See the "Proposed Final Environmental Statement: Liquid Metal Fast Breeder Reactor Program" published in Dec. 1974, Section 7.4.2.

**The question of what level of risk is acceptable and what level of protection is acceptable (desirable) involves matters of preserving the basic freedoms of our society and the allocation of national resources. The benefit to society from reducing the risk arising from wilful action against society involving nuclear materials should be balanced, in the overall context of allocating national resources, against all other benefits which could potentially be obtained from those resources.

successwhen an attempt is made; and (c) reduce the consequences of a successful act.

As political, social and technological conditions inevitably change, the relationships among these parameters and the magnitude and nature of effort required to reduce them will also change. Therefore, the program objectives, and evaluation of effectiveness will have to take into account the fact that the individual risks and associated probabilities are also changing in time.

The above provides a framework within which to build and maintain a coherent and balanced safeguards system. The system involves knowledge of (1) the nature and dimension of the threat, (2) the ability to counter this threat throughout the many steps required before completion of any malevolent act, and (3) the destructive effects of adversary success.

The adversary actions leading to harmful societal consequences necessarily take place in a sequence, which will usually consist of a preparatory phase, an access and acquisition phase, and, in the case of theft, a utilization phase. These could include several of the following activities:

(1) decision to cause and produce the event;

(2) organization of perpetrators;

(3) planning of attempt;

(4) acquisition of physical resources;

(5) acquisition of information on material location and protection;

(6) external penetration of facility or vehicle;

(7) access to facility;

(8) control of vehicle;

(9) access to material;

(10) destruction and/or manipulation of equipment or material;

(11) removal of material;

(12) construction of explosive or dispersal device;

(13) delivery to event location; and

(14) event-detonation, critical incident, or dispersal.

The safeguards system should employ activities to counter all relevant adversary action sequences. The goal of interrupting the action sequence may be accomplished by deterring an attempt or by detecting an adversary action and responding to prevent the completion of the sequence. The general principle to be applied is "protection in depth"--that is, to provide multiple opportunities to interrupt any adversary action sequence. The opportunities are increased by detecting an adversary action as early as possible. This implies that time is a critical parameter in increasing the effectiveness of specific safeguards activities.

Safeguards measures that can be used to impede the adversary action sequence include:

(1) Legal provisions establishing adversary actions as criminal acts punishable by severe penalties.

(2) Public information that communicates a high probability of adversary failure and thus causes apprehension.

(3) Liaison with police intelligence organizations to detect preparatory adversary activities.

(4) Legal provision for rewarding informants.

(5) Physical barriers to impede entry into a transport vehicle or into a facility except through well-defined, authorized portals.

(6) Sensors and alarms to detect attempts at entry through the physical barriers.

(7) Access controls to detect attempts at unauthorized entry through normal portals.

(8) Monitoring systems to detect unauthorized passage of nuclear materials, weapons, high explosives, or other adversary tools through barriers or portals.

(9) Hardened facilities, containers, storage vaults, or vehicles to deter and delay attempts to remove or disperse nuclear materials.

(10) Communication systems to assure timely and appropriate response to alarms generated by instruments or personnel.

(11) Armed security personnel at fixed sites and accompanying shipments of nuclear material to provide an immediate response to the alarms at a level that takes into account the ability of reserve law enforcement and military units to provide a timely response force.

(12) Internal controls and administrative procedures to provide timely detection of diversions that might go undetected by perimeter controls and monitors.

(13) Police intelligence and detection activities directed at the recovery of stolen material prior to its utilization.

(14) Negotiations also impede the action sequence .

The goal of reducing the consequences of successful adversary action is approached by reducing the potential hazard inherent in a nuclear facility or material or by responding to an event or a threatened event in a manner that reduces the effect on life and property. The measures relevant to this purpose include:

(1) Facility siting, design, and operating criteria to limit potential consequences of sabotage.

(2) Vehicle design and operating criteria to limit potential consequences of sabotage.

(3) Criteria for physical and chemical form of material at certain points in the fuel cycle to impede its use as an explosive or dispersal weapon.

(4) Provision for automatic reaction to certain adversary actions which drastically alters the material or facility so as to reduce the hazard of adversary success.

(5) Prior organization and planning for evacuation and decontamination.

The societal risk approach described above is currently being studied for future application to the design and evaluation of the safeguards system. Currently, and in the past, however, the effectiveness of safeguards has been considered in terms of effectiveness of individual elements of the overall safeguards system; i.e., on a "subsystem basis" where the subsystems* are directed towards individual adversary steps (such as forced access to a facility, or internal diversion of material) rather than to entire adversary action sequences. The terms used to measure the effectiveness for these subsystems are related to various individual possibilities which are countered for that particular adversary action. Examples of these terms of measurement are (a) the degree of force which can be withstood by a facility perimeter security system, or (b) the complexity of adversary strategy which must have been used in a detected

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* A complete set of subsystems has been defined as part of the societal risk studies currently under way.

internal diversion. However, the relationship of these subsystem evaluations to one another or to the adequacy/ effectiveness of the safeguards system as a whole cannot readily be determined precisely. It should be recognized that increasing effectiveness of one subsystem or another, while ignoring the needs, problems or level of effectiveness of other subsystem components of the overall safeguards system, may be an inefficient use of resources.

The subsystem approach recognizes that the existence of the specific elements of the safeguards system makes any attempt at a malevolent act more difficult than if the elements did not exist.

4. Adequacy of Domestic U.S. Safeguards

A. Determining Adequacy

Threats of violent activity may conceivably arise from several sources: for example, psychotics, disgruntled employees, dissidents from labor-management disputes, criminals, or political terrorists. Factors which characterize a threat include the motivation and resources of the individual or group, the makeup of any such group, and the timing and mechanism chosen for the illegal act. Unfortunately, long-range predictions regarding political, social or economic conditions

which could motivate individuals or groups to take violent action are largely speculative. What the adversary will do cannot be reliably predicted. Studies conducted to date have not identified an easy way to predict definitively the characteristics of the adversary nor have they been able to determine the probability that a particular scenario would be attempted by the adversary.

Measuring the risk to the public, in a purely objective, quantitative way, is therefore not possible because there are factors involved in determining the frequency of attempt (such as assessing motivation and probability of various types of adversary decisions as a function of a potential adversary group) which cannot be determined. It is possible, however, to develop and maintain a generally internally consistent system (i.e., to allocate safeguards resources in a manner which results in a general equality of the individual risks from all reasonably possible adversary action sequences) without quantifying the acceptable level of risk or being able to calculate the individual risk for each adversary scenario.

B. Conclusion

From the foregoing, it is quite clear the precise quantitative evaluation of effectiveness of the safeguards system as a whole is not possible at this time. However, the Atomic Energy Commission (now ERDA and NRC) has employed

professionals in the areas of physical protection, materials accountancy, measurement technology, chemistry, nuclear materials processing, statistical techniques and other related safeguards disciplines to ensure that the best experienced judgment is brought to bear on the problems related to theft and diversion. Also, knowledgeable contractors and consultants have been used in this area. Over the years, many external, in-depth studies of the safeguards system have been undertaken and their conclusions and recommendations have been considered. It is recognized by all of the professionals involved that the system could never provide complete assurance. There can be component failures (e.g., malfunction of electronic component in alarm systems), "weak links" in the system, or the threat that the system it is designed to counter may change. It is precisely for these reasons that the current system designs call for "in-depth" measures.

It is also recognized that these safeguards and physical security problems have international implications. The U.S. cannot unilaterally control proliferation or terrorist activities. Therefore, we are working with other countries

to improve the effectiveness of domestic safeguards and physical security systems throughout the world.

It is also recognized that the absence heretofore of any successful malevolent acts involving special nuclear materials and facilities handling these materials does not in itself demonstrate the effectiveness of a safeguards system (i.e., such absence could be the result of the lack of criminal motivation rather than the deterrence thereof.) However, it appears that malevolent acts have not occurred, and many experts believe that this is due in some degree to the effectiveness of the system.

It is our considered judgment that domestic safeguards need to be kept under continuing review for the purpose of strengthening them. Measures to strengthen safeguards are now under development. In the future, additional safeguard measures will be required as the volume of materials grows and the technical complexities of facilities increase.

E. INTERNATIONAL NUCLEAR SAFEGUARDS

1. Introduction

The purpose of international safeguards is to provide credible assurance that states have not diverted SNM from peaceful programs to nuclear weapons or other nuclear explosive devices. International safeguards are based on the assumption that a complementary system of domestic safeguards would be implemented to prevent malevolant subnational thefts or sabotage involving SNM. The domestic safeguards system protects against diversion of nuclear materials primarily by physical protection techniques. The system also incorporates accountancy to detect diversions if they should occur, to facilitate reacting to detected diversions and to enhance recovery capability of diverted or stolen materials.

The international safeguards system deters diversion by the threat of early detection of diversions should they occur at the national level and by the political consequences resulting from reporting of diversions to the international community. This system is primarily based on verification through independent measurements of material accountancy data but also includes important surveillance and containment measures.

The existence of a domestic safeguards system with effective physical protection and material accountancy measures enhances the efficiency of the complementary international system.

However, in principle, the international system may compensate for inadequacies in the accountancy part of the domestic system by expanding the international activities or by suggesting modifications in the domestic system.

The need and mechanism for international nuclear safeguards arose on December 8, 1953, when President Eisenhower addressed the United Nations General Assembly and proposed an Atoms-for-Peace Program and the concomitant establishment of an International Atomic Energy Agency (IAEA). These proposals were intended to promote peaceful applications of nuclear energy for the benefit of all the peoples of the world. The proposal also recognized that the IAEA was to provide, as part of its program, international safeguards control over these peaceful activities using nuclear energy in order to insure that any assistance provided should not be used in such a way as to further military purposes. Refer to Annex B for further details.

During the period which was required to establish the IAEA, the United States initiated a program of bilateral assistance to other nations. This assistance was based on a comprehensive revision of the Atomic Energy Act in 1954. The revision included a requirement for a guarantee by the cooperating party that any material to be transferred pursuant to an agreement for cooperation would not be used for atomic weapons or for research on or

development of atomic weapons or for any other military purposes. Safeguard rights have typically been reserved by the U.S. in these bilateral agreements for cooperation. These rights were the basis for the U.S. bilateral safeguards program.

Negotiations were undertaken leading to the creation of the IAEA in 1957. The Agency's Statute authorized it "to establish and administer safeguards designed to insure that special fissionable materials and other materials, services, equipment, facilities and information made available by the Agency...will not be used in such a way as to further any military purpose." This authorization is the basis for the IAEA's safeguards program.

During the period of developing international safeguards, countries other than the U.S. also implemented interim bilateral safeguards programs. Additionally, two[1/] multinational groups were formed with their internally implemented multinational safeguards. The more important of these is the European Atomic Energy Community (EURATOM). The U.S. entered into a bilateral agreement with EURATOM. The multinational safeguards implemented by EURATOM satisfied U.S. requirements under this agreement. Subsequently,

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[1/] EURATOM and NEA (Nuclear Energy Agency)

IAEA and the EURATOM countries signatory to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) negotiated an agreement in accordance with Article III (safeguards) of the Treaty, which will come into force once all of the Euratom countries except France have ratified the Treaty. Under the agreement, EURATOM will continue to implement its safeguards program and the IAEA will implement its safeguards in cooperation with EURATOM.

None of the above noted international safeguards programs include formal inspection of physical security measures.

2. IAEA Safeguards

When the United States ratified the Agency's Statute, IAEA safeguards were looked upon as an inevitable and necessary replacement for U.S. bilateral safeguards since unilateral controls were felt to be more credible to the world at large and more efficient than numerous bilateral safeguard arrangements applied by different suppliers. Subsequently, as a matter of U.S. policy, bilateral safeguards have been largely suspended as long as international safeguards are in effect.

Initially, IAEA safeguards were applied in connection with Agency sponsored projects. A modest system for this purpose was developed, approved, and implemented in 1961. Responsibilities for IAEA safeguards increased with larger and more complex facilities coming under their program. Therefore, the IAEA system was more explicitly defined, expanded and approved in 1963. The system was further extended in 1966 and 1968. The

principal source of expanded safeguards responsibilities came about as trilateral agreements replaced previous bilateral agreements. Other safeguards responsibilities came from unilateral submissions. By 1970, a total of 32 states were involved in 44 safeguards agreements with the IAEA.[2/]

Consistent with the basic U.S. policy objectives, the U.S. has sought to turn over its bilateral safeguards responsiblity to the Agency. The first step in reaching this objective was taken in 1963 when responsibility for implementing safeguards under the U.S./Japan agreement for cooperation was taken over by the Agency under a trilateral agreement. Subsequently, the safeguards aspect of the U.S. bilateral program has continued to phase out in favor of the Agency program.

3. Non-Proliferation Treaty

Under the terms of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), Non-Nuclear-Weapon States party* to the Treaty forswear the right to manufacture or acquire nuclear weapons or other nuclear explosives, and undertake to accept safeguards on all peaceful nuclear activities within their

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2/ Para 1 - Preparatory Committee for the Review Conference of the Party to the Treaty on the Non-Proliferation of Nuclear Weapons NPT/PC.III/4, 17 January 1975.

* See Annex E.

territories, as set forth in agreements with the IAEA for the purpose of verifying the fulfillment of obligations under the Treaty. All States party to the Treaty are similarly obliged by the NPT not to export source or special nuclear material to any Non-Nuclear-Weapons State unless such materials are safeguarded by the IAEA. During the period 1970-1971, the IAEA safeguards system was extensively reviewed and a new system was devised for use in implementing the NPT.

In accordance with Article VIII.3 of the Treaty, a conference of the Parties to the NPT will convene in May 1975, some five years after the entry into force of the Treaty, to review its operation with a view to assuring that the purposes of the Preamble and the provisions of the Treaty are being realized. While one of the subjects which may be discussed at the conference is NPT safeguards, this topic is not expected to become a major issue at the Review Conference. While the possibility that safeguards would be burdensome to and result in commercial disadvantages for safeguarded States was vociferously contended by some at the time that the NPT and some related safeguards agreements were being negotiated, most Parties are expected to agree that it is now premature to pass judgment on NPT safeguards since only a minority of countries Part to the Treaty have at present

had much experience in being subjected to such safeguards. To date, most NPT obligated Parties have completed negotiation of their NPT safeguards agreements with the IAEA.

4. IAEA Organization

Agency safeguards responsibilities as of March 14, 1975, included 55 safeguards agreements approved by the Board of Governors. Twenty-one of these agreements are with States with significant nuclear activities.

The IAEA employed a staff of 136 to carry out its safeguards program in 1974. Of these, 101 were professionals and 35 were support staff. This staff is expected to be adequate to carry out the IAEA program through 1975.[3/] A budget of $3.9 million was required to support the IAEA safeguards program in 1974. An increased budget requirement of $4.8 million is estimated for 1975.

Organization

The IAEA safeguards program is conducted by the Department of Safeguards and Inspection. This is one of five departments in the Agency reporting to the Director General. The Safeguards and Inspection Department is subdivided into two divisions--

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[3/] Pg M.2 GC(XVIII)/526 - The Agency's Programme for 1975-80 and Budget for 1975.

Development and Operations. The Development Division is assigned responsibility to provide concepts, procedures, techniques, and equipment for making safeguards technically and economically effective. The Operations Division is responsible for implementing these safeguards.

Program

The IAEA safeguards system is based on existing national nuclear material accountancy and control systems. IAEA safeguards are designed to verify that source and special fissionable materials are not diverted to nuclear weapons or other nuclear explosive devices. The Agency takes due account of the technical effectiveness of the State's system in performing its verification. Inadequacies in the State's system can, in principle, be compensated by expanding the IAEA role, if the resources are available, or by suggesting modifications to improve the State's system.

The State is the fundamental unit of the IAEA safeguards system. This is based on the assumption that within a given State, nuclear facilities are subject to the same legislation. The IAEA system within the State is concerned with the location and flow of nuclear material. The subunit in the State's safeguards system is the material balance area (MBA). In theory, the MBA facilitates material accountability since all material entering or leaving the area can be determined when necessary. A particular

plant is not always an ideal MBA. The establishment of MBAs to assure that measurement points where information about material flow between MBAs and inventory in each MBA is provided is done in consultation between the State and the Agency. The designation of MBAs is included in Subsidiary Arrangements which describe the "fine structure" of the Agreement.

The national system of accounting for and controlling nuclear material must be such that the IAEA can independently verify the flow and inventory of nuclear material. The Agency verification is accomplished principally by material accountancy, complemented by containment and surveillance.

Containment refers to methods including the application of locks, seals and other devices on nuclear material storage and operating areas to prevent changes in the contents without the Agency's knowledge and thus add a measure of certainty which can simplify accounting verification. Such devices are periodically inspected for evidence of tampering.

Surveillance refers to both human and instrumental observations and safing devices to monitor plant activities which may involve material movement.

The IAEA safeguards system in operation includes two basic features--accountancy and inspection.

Under the IAEA's program, material accountancy is based on the collection of measurements and other determinations by the operators of each MBA which provide a current and quantitative picture of the location and movement of nuclear material.

Accountancy, in the IAEA system, consists of the initial determination of physical inventory for a material balance area; the perpetuation of a book inventory based on the original determination and subsequent measured inventory changes; verification and updating of the book inventory by periodic physical inventory measurements; and the submission of reports to IAEA by the State. The Agency maintains a set of accounts parallel to the State based on these reports. These accounts are subject to verification and comparison with the records kept at the facility.

The key to verification by the Agency is the right to conduct on-site facility inspections. The IAEA system includes three types of inspections: ad hoc, routine and special. The majority of the inspection effort is expended on the routine inspections.

Routine inspections verify the location, identity, quantity and composition of safeguarded materials. These inspections

also verify information on the cause for shipper/receiver differences, book inventory uncertainties and material unaccounted for (MUF). Ad hoc inspections are made to verify initial reports or international transfers. Special inspections are made for unusual circumstances or when the IAEA considers all available information inadequate.

The safeguards agreement specifies the maximum routine annual inspection effort which the Agency may use in terms of frequency or manpower.

The IAEA safeguards activities are implemented to minimize interference with the construction or safe normal operation of any facility.

A typical routine IAEA inspection includes: examination of pertinent records, independent measurements of safeguarded nuclear material; check and/or calibration of measurement and control equipment; observation of procedures, perhaps including use of IAEA calibration standards or analytical samples; and request for duplicate or additional samples and measurements for subsequent IAEA analysis.

Inspections are carried out by a team from the professional staff. In assigning an inspection team to a specific country,

the Agency submits to the State the names, professional qualifications and nationalities of all proposed designees. The State has the right to refuse the designation of any inspector so long as this does not unduly interfere with the safeguards process. The inspection team is chosen from the panel of accepted designees by the Director of the Operations Group.

Cooperation With Others

The Agency's safeguards system has developed with active participation and assistance from the U.S. as well as other member States. The Agency has received results from U.S.-sponsored safeguards R&D. Additionally, the Agency has conducted exercises in the U.S. to gain operating experience using procedures which are being considered for routine future implementation.

Member States have participated in Agency sponsored meetings to address specific questions and to lend practical guidance for the development of the safeguards system.

5. U.S. Bilateral Safeguards

The U.S. bilateral safeguards program is based on rights reserved under bilateral agreements for cooperation in the civil uses of atomic energy. These agreements grew from implementation of the Atoms-for-Peace Program.

The U.S. bilateral program was principally concerned with determining that supplied materials and facilities were not used to further any military purpose.

Two elements of the safeguards system are required to make the above determination. The first element of the U.S. bilateral program is the requirement for the maintenance and review of records and reports showing receipt, production, consumption, transfer, use and current location of all nuclear material. The second element is conducting on-site inspections to determine the validity of the reports and records and the compliance with the commitment to peaceful uses.

The record keeping system is a significant element in a safeguards program where material is transferred between facilities; particularly where the facilities are under different jurisdictions. In this case, where independent measurements of materials are reported, the record keeping system can be an important and effective means of control in its own right. When material remains within a single jurisdiction the potential exists for deliberate collusion to falsify records. In this case, the effectiveness of records as a means of control for safeguard purposes is greatly reduced.

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On-site inspections are the second and crucial element in the U.S. bilateral safeguards program. The inspection includes a physical inventory of material to determine whether it complies with reported figures and an independent verification of the inventory by the inspectors. Verification techniques such as sampling for destructive analysis and use of non-destructive assay (NDA) equipment have been used.

Seals which will reveal the removal of materials have been used as an extension of the verification techniques where materials are expected to remain static between inspections. Seals may permit a substantial reduction in the effort required for subsequent inventory verification.

The U.S. program continued to operate while the IAEA program developed. Safeguard techniques developed in the bilateral program program are made available to IAEA as are reports of our research and development activities. The U.S. takes an active part in international meetings on safeguards.

The first U.S. bilateral inspection was carried out in 1959 in Sweden. As of January 1, 1975, a total of 1,043 individual bilateral facility inspections in 28 countries in Europe, South America and the Middle and Far East have been conducted.

6. EURATOM (Multinational Program)

The Rome Treaty of 1957 established a basis for cooperation in nuclear energy among the original six[4/] member States. Controls on the nuclear materials and equipment used for civil uses under this cooperative agreement are implemented by EURATOM. This program is mandatory for each member State and the EURATOM inspectors conduct on-site facility inspections. A system of records and reports is also required. EURATOM and the United States have a bilateral agreement for cooperation in the civil uses of atomic energy.

Under this agreement, EURATOM is responsible for implementing safeguards on U.S.-supplied materials and equipment. Supplemental to the agreement is an understanding[5/] that the U.S. and EURATOM will cooperate in the field of safeguards to permit technical exchanges for evaluating the effectiveness of the EURATOM safeguards system. Several meetings have been held for this purpose.

The EURATOM program consists of material accounting and inspection. The community membership was recently enlarged[6/] and the concomitant increase in workload will require an increase

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4/ France, Belgium, Luxembourg, Germany (FRG), Netherlands, Italy.
5/ Kohnstamm/Butterworth letter of June 18, 1958.
6/ To include the United Kingdom, Ireland, and Denmark.

in the EURATOM safeguards staff. The EURATOM program includes several laboratory facilities to carry out safeguards research and development tasks. EURATOM uses these developments as well as technology developed by others to continuously improve their system. Additionally, EURATOM-sponsored developments are shared with others through international exchanges.

EURATOM countries which are signatories to the NPT have negotiated an agreement with the IAEA recognizing the role of the EURATOM program toward fulfilling IAEA/NPT safeguards requirements. This agreement provides for IAEA verification of EURATOM safeguards findings. The agreement was signed by EURATOM and IAEA in September 1973 and has been approved by the Community and ratified by the Federal Republic of Germany, Denmark, Ireland, Luxembourg, and the Netherlands. Ratification by Belgium is expected very soon. Ratification by the remaining Community members is in the national approval process.

7. Physical Security

There must always be concern that some nuclear materials might fall into the hands of subnational groups or international terrorists who might misuse them to the serious detriment of others.

The United States recognized the need for physical security to control nuclear materials in the early days of the nuclear program. Initially, the objective of physical security was to protect effectively scarce and valuable materials. This objective was further justified by the security classification of the programs using the materials. These objectives and justifications are still relevant in the U.S. nuclear program. Recently, the worldwide increase in the frequency and ruthlessness of terrorist activities have focused attention on the need for physical protection of nuclear materials to preclude their use as a terrorist weapon. International activities by some terrorist groups indicate that an internationally-coordinated response is desirable for effective protection.

The physical protection activities in a country are considered to be a national responsibility. In 1972, the IAEA sought from a panel of experts recommendations for physical protection of nuclear materials. These recommendations were made available by the Agency to member States for guidance in establishing national physical security programs.

The United States is taking an active role in alerting others to the needs for better physical security. We have bilaterally

exchanged technical information on physical security with other States and are currently participating in a review of the IAEA recommendations concerning minimum standards for physical security.

The U.S. recently has adopted new policies applicable to authorizing the export of special nuclear material. Specifically, additional oversight has been placed upon export of uranium enriched to greater than 20% in the isotope U-235 (HEU), plutonium and U-233. The U.S. has adopted the policy that, in addition to requirements presently established, no future license or authorization will be granted for the export, and/or retransfer, of greater than five kilograms of U-235 enriched to greater than 20% and/or two kilograms of Pu or U-233, unless the government of the recipient country has established a system of physical security measures acceptable to the United States.

Domestically, the United States has sought to maintain a high level of physical protection for nuclear materials. Since the terrorist character of the threat has been recognized as viable, the domestic system has been strengthened. Studies have been made for a coordinated approach for additional upgrading of protection.

Particularly, the vulnerability of nuclear materials in transport has been recognized. Steps to protect material in transport have already been taken and additional upgrading actions are being studied.

The results of the U.S. experience and developments will be shared with other nations, and we may expect to benefit from their experience.

The IAEA recognizes the importance of physical security to national safeguards programs and plans an Advisory Group meeting for April 1975 to review and update the earlier recommendations. The U.S. will contribute our current experience in physical security matters to that meeting. The Agency is also considering proposals for an international convention to establish physical security standards.

8. Adequacy of International Safeguards

Prior to considering the adequacy of the IAEA safeguards system, the IAEA's objective should be identified and contrasted with the objective of the domestic system. The objective of the IAEA safeguards system is to detect national level diversions of nuclear materials, and thereby deter attempts; whereas the

objective of domestic systems is to prevent diversion and possible subsequent other malevolant acts.

The desired effects of the IAEA system are: to deter national level diversion of safeguarded nuclear material by the governments of the countries involved; to place a responsibility on those governments to institute domestic programs which would deter subnational (anti-government) diversion of safeguarded nuclear material; to reduce specific international tensions by providing a degree of assurance among countries, especially hostile neighbors, that the safeguarded country is not developing nuclear weapons; and to create a general environment of confidence that, to the extent safeguards are being applied, international nuclear commerce to exploit the peaceful benefits of nuclear energy can be freely conducted without contributing to insecurity and tension among nations.

There is clearly a broad range of technical and procedural rigor possible in the implementation of the safeguards system which would bear on the effectiveness--from occasional visits to facilities involving minimal independent verification--to a tight, statistically-based, highly independent technical program of verification. At the present time, the majority

of IAEA safeguards efforts lie between these extremes; however, the IAEA safeguards staff is constantly striving to upgrade performance. In the past, the major safeguard activities have been associated with research reactors, low enriched power reactors, fuel fabrication and research and development facilities. No large-scale bulk processing facilities handling plutonium or highly enriched uranium have been subject to IAEA safeguards, and no international experience in safeguarding them exists. Such strategic and highly complex facilities are expected to be under IAEA safeguards in the next few years. Specific procedures are being developed and must be tested and revised in light of further experience. In addition, the Agency's safeguards workload will be increasing dramatically when the EURATOM/IAEA NPT safeguards agreement and the U.S. and U.K. voluntary safeguards offers* come into effect. It may be anywhere from one to four years from now before the workload reaches a steady growth rate and patterns of implementation become relatively well developed and established. Until that time, the concept of "effectiveness" or "adequacy" is somewhat questionable, if not meaningless, when applied to such a changing situation. What the effectiveness or adequacy will be at that time in the future when the system has reached some equilibrium will depend to a large extent on the way the Agency and its member States will deal with the following issues:

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*The U.S. and U.K. have volunteered to place certain civil nuclear facilities under IAEA safeguards.

1. Financing of safeguards efforts.
2. Developing efficient logistics for carrying out worldwide safeguards operations.
3. Achieving realistic and effective manpower levels.
4. Developing and implementing (with safeguarded States' cooperation) an effective safeguards information handling system.
5. Assuring that the Agency is provided with sufficient rights in its arrangements with safeguarded States to enable it to implement effective safeguards.
6. Developing and elaborating further the structure and logic of the safeguards system, both technically and politically, e.g., as new types of facilities, such as enrichment plants, come under international safeguards.

Secretary Kissinger assured the 29th UN General Assembly that the United States will intensify its efforts to ensure the effectiveness of IAEA safeguards procedures. The U.S.S.R. and other major nuclear countries are joining in this effort.

It is difficult to demonstrate quantitatively whether, or to what degree, international safeguards actually accomplish the desired effects; however, a qualitative assessment of the current effectiveness can be made. The fact that no nation has detonated

a nuclear explosive device using internationally safeguarded nuclear material may be related to the existence and effectiveness of those safeguards.

Based on our experience with IAEA accountancy safeguards, it is our judgment that the system will detect and thus make an important contribution to deterring any efforts at diversion by States. We also believe that as the volume of materials and the nature of facilities elsewhere in the world grow in their technical complexities, improvements in the equipment, staffing, and frequency of inspection and funding of the IAEA system are and will continue to be needed. A high level of U.S. financial, diplomatic, and technical support will be necessary. With respect to the IAEA safeguards system and with respect to subnational thefts, sabotage and terrorism, improvements are needed in most national systems which complement and are an essential element of the IAEA system. The principal improvement needed is to establish adequate physical security in those states which do not already have such systems.

9. Efforts to Improve Effectiveness of Safegaurds and Physical Security Measures

The U.S. is encouraging the adoption of effective physical security measures in other countries by supporting the adoption of an international convention on physical security and the strengthening of IAEA safeguards by aiding and supporting IAEA safeguard development efforts.

The U.S. has been in the forefront of those working toward the adoption of adequate international physical security measures. As an example, we recently have begun to include a requirement for mutual agreement on the physical security measures to be applied under our bilateral agreements for cooperation. We maintain an active research and development program to develop up-to-date techniques and equipment designed to cope with all types of possible threats while minimizing disruption of the essentially commercial character of the nuclear power industry. We are exchanging technical information in this area with other nations and with the IAEA.

Other nations have reached the technical level which permits them to compete effectively with the U.S. in selling nuclear reactors and equipment throughout the world. This country must cooperate closely with these other supplier nations to avoid a competition which would be based on minimizing the safeguards applicable to purchaser nations. Thus, it is necessary to convince the supplier nations that it is in their interest to assure that the proper safeguards and physical security measures are placed on all sales of nuclear material and equipment so that all nations may have an assurance that such materials and equipment will not be diverted to nonpeaceful purposes nor fall into unauthorized hands.

The U.S. is taking the lead in supporting a major effort in the IAEA to improve international safeguard systems and to strengthen the recommendations for the physical security of nuclear material developed under the auspices of the Agency and published in March 1972. Such measures should provide restraints against terrorist groups who may attempt to gain control of such material. Adoption of such measures on an international scale would significantly reduce the risk associated with the potential threat to the sensitive areas of the nuclear fuel cycle (i.e., chemical reprocessing, fuel fabrication of highly enriched uranium and plutonium, and transportation.)

ANNEX A

DOMESTIC NUCLEAR SAFEGUARDS

Background Information

1960-1970

Until 1964, all nuclear fuel (special nuclear material) was owned by the Federal Government and was processed and fabricated under contract with the AEC. All nuclear fuel used by the nuclear industry was leased from the Federal Government. Legislation was enacted in 1964 permitting private persons under license to purchase and own special nuclear material. Management concern for protection of valuable property, as well as the public safety, resulted in the adoption of any customary industrial security and accountability measures for the nuclear industry through the early 1960's.

In 1967, a Division of Nuclear Materials Safeguards was established under the AEC Director of Regulation. Thereupon, two aspects of domestic safeguards for special nuclear materials clearly emerged. These were:

- material in the Government-owned and license-exempt plants and transportation of AEC (now ERDA) contractors, and
- material in commercially-owned plants and in transportation of licensees, then regulated by the Director of Regulation of the AEC (now NRC).

Some differences inevitably exist between safeguards implementation required by the regulations applicable to licensees and the manual chapters that are issued for ERDA contractors, but the regulations and manual chapters are written so that any difference in safeguards effectiveness is minimized. Small differences arise from the fact that federally commissioned guards are used at some federally-owned contractor facilities, but private guards are used at the privately-owned licensee facilities. Also, certain secure vehicles with classified designs are available to ERDA for transpotation, but not to licensees.

1967 Florida Power and Light Decision

In early 1967, in connection with a challenge to the issuance of a license to Florida Power and Light Company (Turkey Point reactors), the Commission declared its expectation that the staff "...in accordance with its practice...assure that appropriate industrial security measures are provided for by the applicant." (emphasis added)[A-1/]

A-1/ In February 1967, the AEC published a notice of proposed rulemaking on "Exclusion of Attacks and Destructive Acts by Enemies of the United States in Determining the Issuance of Facility Licenses." (On September 26, 1967, an effective rule, 10 CFR 50§13, was published.) As a consequence of the notice of proposed rulemaking, the Atomic Safety and Licensing Board asked the Commission for guidance on the inclusion of sabotage as a consideration in making findings on a grant of license. The Commission's Memorandum and Order, February 20, 1967, indicated that questions of sabotage potential, as bearing upon public health and safety, were to be considered if in the realm of industrial (presumably of domestic origin) sabotage as opposed to sabotage by an enemy of the United States, but at the operating license stage rather than construction stage. No regulation pertaining to safeguards against industrial sabotage existed at the time; the licensing process was the mechanism for handling industrial sabotage.

Department of Defense Responsibility for Non-Military Facilities

The Department of Defense (DOD) was made responsible for protecting industrial facilities against destructive acts of foreign enemies. In response to inquiries by the Joint Committee on Atomic Energy, the Department of Defense wrote to Chairman John O. Pastore on January 9, 1968, explaining the policies of Department of Defense toward industrial facilities. The letter stated that the Army was responsible for developing physical security standards, for conducting surveys for assessing vulnerability to sabotage by foreign enemies, and for providing guidance to industrial management. The letter observed that inherent safety features of power reactors make the release of fission products difficult, and "... if the goal is harm to the public, there are far more lethal means that concern us that can affect large numbers..." It was concluded that evaluation of threat potential indicated the present level of effort was adequate.

1970-1974

As of the beginning of 1970, there were no specific AEC criteria against which the adequacy of physical protection

measures at fixed sites were judged nor any specific requirement that guards be armed. However, over the preceding year, power reactor license applicants had been required to submit descriptions of industrial security measures.

In a letter to AEC Chairman Glenn T. Seaborg on December 14, 1970, Chairman Chet Holifield of the Joint Committee on Atomic Energy wrote:

> "The rash of incidents of suspicious origin resulting in personal injuries, death or serious property damage, which has been occurring over the past several years, and very recently impacted in Linden, New Jersey, prompts this inquiry to ascertain what the Commission's views are with respect to the adequacy of the physical security of licensed nuclear facilities.
>
> "The Joint Committee, during public hearings in the past, and in meetings of its staff with Commission representatives, has been informed generally of the steps taken by the Commission through its Regulatory arm to assure that proper consideration is given by licensees to protection of nuclear facilities against sabotage. However, we wonder whether the increase in the frequency and magnitude of destructive acts have suggested the advisability of new Regulatory posture."

The reply to Congressman Holifield from Dr. Seaborg pointed out a study by McCullough and others[A-2/] on potential sabotage of reactors. The reply also noted that power reactor applicants were requested to submit security plans, and that a safety guide for security programs was currently under development.[A-3/] However, it was said that aspects of the prospective guide were already being used as "interim guidance" for evaluating security measures. Other means by which security practices had been strengthened were explained. The reply closed by saying:

> "Actions carried out by professional subversive groups trained in sabotage and familiar with the facility have not been previously considered in our reviews. As a result of recent acts of sabotage at nonnuclear facilities, this policy is being reevaluated...."

During the latter part of 1973 and early 1974, the General Accounting Office examined the effectiveness of programs and procedures for safeguarding nuclear material in possession of AEC licensees and contractors and while in transit. In the November 1973 report [A-4/] GAO noted several conditions at two licensed plants which "significantly limited the holders'

A-2/ C. R. McCullough, S. E. Turner, and R. L. Lyerly, "An Appraisal of the Potential Hazard of Industrial Sabotage in Nuclear Power Plants," Southern Nuclear Engineering, Inc. Report SNE-37-UC-80.

A-3/ Safety Guide 17 was published October 27, 1971.

A-4/ "Improvements Needed in the Program for the Protection of Special Nuclear Material;" B-164105, Report to Congress by the Comptroller General of the U.S., November 7, 1973.

capability for preventing, detecting, and effectively responding to a possible diversion or diversion attempt." GAO noted the AEC had undertaken an internal study of its physical protection program, that it was completed in 1971, and that AEC was slow in implementing recommendations for strengthening programs. The report said:

> "AEC needs to define in greater detail the expected capability of a protection system by providing more specifics relating to its prevention, detection, and response capability."

It should be pointed out that the Commission had already decided to apply more stringent requirements prior to the issuance of the November 1973 GAO report. The deficiencies noted in the report were subsequently corrected by the new Part 73 (of Title 10 of the Code of Federal Regulations) requirements which was published for public comment in February 1973 and issued in effective form in November 1973.

In its April 1974 report pertaining to transit security, the GAO again referred to these points, and added that similar conditions were observed for material in transit. The GAO said:

> "During September and October 1972, we observed the protection afforded three large shipments of highly enriched uranium...and found that the material was susceptible to a diversion or a diversion attempt."
> "...although the shipments were made in accordance with AEC's requirements in effect at the time, the protection afforded the material was inadequate...."

At the time of the GAO report, the Commission proceeded to strengthen in-transit protection by placing more stringent requirements upon the firms arranging for the material to be shipped or received (rather than upon the carrier.)[A-5/]

The GAO concluded that actions taken by the AEC since December 1972 "present important steps toward accomplishing the objective of the safeguards program." The AEC was urged to closely monitor shipments and strictly enforce new requirements and then study the feasibility of a Government transportation system if the new requirements did not afford necessary protection.

In its October 16, 1974, report on commercial power plants, the GAO called upon the AEC to clarify the differences involved in counteracting assaults of varying strengths, from assaults by individuals to those by paramilitary groups. This has been provided in regulatory guide 5.43, dated January 1975. The GAO also recommended that the AEC determine any needed increase in security requirements to take account of the prospective increase in spent fuel stored at power plants. The response of the AEC noted that the most recent fuel stored is a greater radiological concern than the increased storage of older fuel.

A5/ The AEC does not regulate the transportation industry to avoid duplication of the regulatory requirements of the Department of Transportation applicable to carriers.

Nevertheless, the strengthened protection requirements for power reactor sites published for comment in November 1974 will provide added protection against radioactive contamination by means of this sabotage.

Senator Abraham Ribicoff chaired hearings held by the Senate Committee on Government Operations[A6/] in February and March 1974, the purpose of which was to receive testimony concerning Senate Bills 2135 and 2744 which related to the establishment of a Department of Energy and Natural Resources, Energy Research and Development Administration, and a Nuclear Safety and Licensing Commission.

Dr. Theodore Taylor[A7/] was one of many witnesses before the Ribicoff Subcommittee. He submitted a formal statement and expressed his concern about nuclear theft and sabotage. AEC officials who testified voiced disagreement with Taylor's conclusion about the ease with which a crude nuclear weapon could be constructed with equipment readily available to the general public.

A6/ Subcommittee on Reorganization, Research and International Organization hearings, February 26, 27 and March 12 and 13, 1974.

A7/ Nuclear Theft: Risks and Safeguards; by Mason Willrich and Theodore B. Taylor, Ballinger Publishing Co., 1974.

A safeguards study, now known as the Rosenbaum Report, was released in April 1974. It has been prepared by an independent group chaired by Dr. David M. Rosenbaum at the request of the AEC. The report considered that existing attitudes and efforts toward providing security for nuclear material had not matured to the same extent as attitudes and efforts toward safety measures. It expressed the belief that "...potential harm to the public from the explosion of an illicitly made nuclear weapon is greater than that from any plausible power plant accident...." A conclusion was reached that the AEC must make a commitment to reduce security related risks to the public to the same level as operational risks.

One of the recommendations for physical security was a review in terms of "design basis incidents." These are analyses, without physical encounters, in which incidents testing physical security are devised in such a manner as to test all elements of the protective systems common to all plants of this particular kind. These methods are analogous to those employed in the "Rasmussen Report"[A8/] analyzing reactor safety. Both

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A8/ Reactor Safety Study, USAEC, WASH 1400, August 1974.

NRC and ERDA have turned attention toward such risk probability analyses. This is done, however, with the full realization that human behavior is much less predictable than the performance of materials or equipment on which the Rasmussen Report is based.

A second physical security recommendation was the use of "blackhat exercises" to achieve a dynamic evaluation of physical security, perhaps in real-life circumstances. Gaming analyses are being prepared on paper by "blackhat" experts, thereby avoiding the dangers associated with actual attempts at physically stealing special nuclear material.

A third recommendation was that a Federal guard force be instituted to protect special nuclear material in commercial facilities. This recommendation stemmed from possible limitations on actions a private guard force could take when dealing with theft situations which could have national security significance. A broad study of a possible security agency for protecting special nuclear material has been started, as required by the Energy Reorganization Act of 1974.

The Rosenbaum study recommended, fourthly, that better liaison be established with CIA, FBI, and other cognizant agencies in all aspects of safeguards. Although NRC and ERDA coordinate

with other agencies on safeguards matters, the number of possible law enforcement agencies involved and the great variety of different incidents that might arise involving special nuclear material loss and misuse are such that even greater coordination is desirable.

Among its recommendations regarding material accountability, the Rosenbaum study included the need for greater speed in ascertaining any loss and, also, the need to analyze the possible paths for diversion. The development of information to establish real-time accountability of material is actively being pursued. Diversion path analysis studies are under way both in NRC and ERDA.

ANNEX B

MULTINATIONAL NUCLEAR POWER - PEACEFUL USES OR INTERNATIONAL TERROR?

excerpts from an article by

Dr. Dixy Lee Ray
Chairman of the Atomic Energy Commission

in the

Pan Am Clipper Magazine
October 1974

Recent U.S. offers to negotiate nuclear power plant sales with the Governments of Egypt and Israel focused renewed attention on international cooperation in nuclear power development. Part of this attention, to be sure, was stimulated by the recent outcry that nuclear power production by these two countries might be the initial step in the development of nuclear weapons capability. The apprehension was heightened because the Indian Government had detonated a nuclear explosive in May, a few weeks before.

First it must be made clear that Egypt and Israel are not neophytes in the nuclear field. Egypt has had a Soviet-built research reactor since 1961, and Israel has had two research reactors--one from the U.S. and the other from France--for more than 10 years. The explosive material used by India came from a research reactor[1] unprotected by safeguards, not from her power reactors.[2] The important point is not so much whether

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[1] A reactor primarily designed to supply neutrons or other ionizing radiation for experimental purposes. It may also be used for training, material testing, and production of radioisotopes.

[2] A reactor designed to produce useful nuclear power, as distinguished from reactors used primarily for research or for producing radiation or fissionable materials.

a nation has a research reactor or a power reactor, but whether there are carefully regulated safeguards on those reactors to ensure that nuclear fuel is not diverted away from peaceful uses.

International cooperation in nuclear power development is not a new venture. It goes back approximately 20 years and was initiated by President Eisenhower's December 1953 speech to the United Nations announcing the Atoms for Peace Program and proposing the peaceful applications of atomic energy. Less than a year later he signed the Atomic Energy Act of 1954 which made possible greater participation by private industry and more cooperation with other nations in developing peaceful applications.

The Atoms for Peace Program got under way in 1955 when President Eisenhower announced in June that the U.S. would contribute half the cost of research reactors to be constructed in friendly nations and would provide technological assistance in construction and operation of power reactors.

In July, some of the first comprehensive agreements covering research and power reactors were signed with the United Kingdom, Canada, and Belgium. Then, in August, the first U.N. International Conference on the Peaceful Uses of Atomic Energy took place

in Geneva, and the U.S. made its first shipment abroad of special nuclear material.[3]

The Atoms for Peace Program also provided for the training of foreign scientists and technicians in nuclear science. The AEC organized training programs at its facilities here in the U.S. as well as through its Atoms in Action Program designed to travel abroad. In the 10-year period between 1959 and 1969, the Atoms in Action Program visited 35 countries providing training in the use of research reactors, nuclear medicine, industrial applications of nuclear science and sponsored programs in education ranging from secondary school to post-doctoral training.

Table 1 shows the extent of participation in the training program here in the U.S. beginning in 1955 to date.

The U.S. recognized that the success of the Atoms for Peace Program clearly was dependent upon reasonable guarantees that the nuclear technology and nuclear material to be shared with other countries would be adequately safeguarded. With no international system of safeguards on which it could rely, the

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[3] In atomic energy law, this term refers to plutonium-239, uranium-233, or uranium containing more than the natural abundance (0.7 percent) of uranium-235, or any material artificially enriched in any of these substances.

TABLE 1

PARTICIPATION OF NONSOVIET BLOC ALIENS IN AEC RESEARCH DURING PERIOD 1955 TO DATE

Afghanistan	3
Argentina	192
Australia	164
Austria	179
Belgium	176
Bolivia	14
Brazil	133
Burma	14
Cameroon	1
Canada	539
Ceylon	12
Chile	70
China	713
Colombia	86
Congo	8
Costa Rica	11
Cuba	28
Cyprus	10
Denmark	96
Dominican Republic	33
Ecuador	13
El Salvador	12
Ethiopia	7
Finland	41
France	471
Germany	833
Ghana	10
Greece	159
Guatemala	16
Guyana	5
Haiti	11
Honduras	1
Hong Kong	59
Iceland	9
India	1104
Indonesia	34
Iran	73
Iraq	24
Ireland	32
Israel	250
Italy	693
Jamaica	15
Japan	803
Jordan	7
Kenya	2
Korea	195
Kuwait	2
Lebanon	31
Libya	3
Liechtenstein	2
Luxembourg	6
Malaysia	16
Mexico	104
Monaco	2
Morocco	2
Netherlands	216
Norway	101
Pakistan	120
Panama	14
Paraguay	11
Peru	41
Philippines	118
Portugal	26
Saudi Arabia	3
Senegal	1
Sierra Leone	1
Singapore	3
South Africa	88
Spain	139
Sweden	180
Switzerland	229
Tanzania	3
Thailand	70
Trinidad	6
Tunisia	3
Turkey	108
Uganda	1
United Kingdom	1186
Uruguay	22
Venezuela	59
Vietnam	23
Yugoslavia	106
Zambia	3
United Arab Republic	103
TOTAL	10,513

AEC was forced to take on the safeguards responsibility by executing bilateral agreements for cooperation. The AEC insisted not only that the agreements contain a provision that U.S.-supplied nuclear equipment and materials and their products would be used only for peaceful purposes, but that the country involved also would give the AEC the right of onsite inspection to ensure that this peaceful use provision was being observed. Safeguards provisions were included in the first bilateral agreement for cooperation in the civil uses of nuclear energy, signed with Turkey in June 1955, and were incorporated in agreements concluded with more than 40 other countries and international organizations.

In 1961, the International Atomic Energy Agency (IAEA), which had been established in 1957, instituted a system of safeguards to cover reactors built in Member States. To help get the international safeguards program under way, the U.S. in 1962 voluntarily placed four of its civilian prototype power and research reactors under the Agency's program, both as a means of testing the system and also to give the IAEA safeguards staff experience in conducting safeguard inspections. The agreement was later extended to a U.S. commercial nuclear power plant and a plant for chemical processing of reactor fuel. By 1968, IAEA safeguards were applicable to all segments of the fuel cycle except enrichment plants.

As the International Agency safeguards system was developing, the U.S. strongly encouraged its bilateral partners to accept IAEA safeguards procedures on material and equipment supplied by the U.S. under bilateral agreements. This has been done through the negotiation of trilateral safeguards agreements among the U.S., the IAEA, and the other countries involved. Twenty-two trilateral safeguards agreements are now in force.

In 1970, under the Non-Proliferation Treaty (NPT), which was ratified by the U.S., U.K., U.S.S.R. and 44 other States, the IAEA was assigned responsibility for assuring through inspection that nuclear materials are not diverted from peaceful uses to the manufacture of nuclear weapons or other explosive devices. Thirty-one nations have agreements with IAEA for NPT safeguards and 20 additional agreements have been negotiated. Under its various auspices, Agency safeguards are now being successfully applied to materials and facilities in a total of 55 countries.

Almost all of these 55 nations are using research reactors, many of which were supplied by the United States. Eighteen of these nations have operable nuclear power plants, and this includes developing countries like India and Pakistan, and three countries of the Soviet bloc. Argentina has the only nuclear power plant below the equator. Eight other nations have nuclear plants under construction.

Even an oil-rich country like Iran recognizes the ultimate limit of its resources and is planning a large nuclear power program. In May, I headed a U.S. delegation to Tehran to discuss cooperative activities in the nuclear energy field. Since that time, Iran has negotiated a five-reactor purchase agreement with France and has signed a provisional contract with the U.S. for fuel enrichment which may provide the basis for later purchase of power reactors.

The U.S. Government also has signed similar provisional contracts with Egypt and Israel and has begun negotiations with them on agreements for cooperation in nuclear energy. Upon conclusion of such agreements, the U.S. will be prepared to sell nuclear power reactors and fuel to Egypt and Israel, which will make it possible for those countries to generate additional amounts of electric power for their rapidly growing needs. The agreements would include strict safeguards against the diversion of nuclear fuel to other than peaceful uses.

U.S. nuclear technology has made a great contribution to the nuclear electric power programs of foreign countries. As of July 1, there had been direct sales of 47 nuclear power reactors abroad, and many other orders of U.S.-design reactors had been placed with foreign manufacturers operating under U.S. licenses.

As a result, the great majority of foreign nuclear power plants are American-type light water reactors which use enriched uranium.

Economic factors are also important considerations in fuels. Current estimates are that by 1985, the U.S. cumulative revenue from sales of reactors and nuclear-related equipment abroad will approach $20 billion, and by the year 2000 about $100 billion (in 1974 dollars). Similarly, for enrichment services, the cumulative value expected by 1985 will approach $5 billion, and by the year 2000 it is expected to approach $45 billion. Of course, there are great uncertainties involved in such projections since they are based on various financial, technological and even political considerations which may change from time to time.

As modern societies reduce dependence on fossil fuels, and begin to develop renewable resources such as geothermal, solar, and nuclear fusion, fission reactors of various types, including breeders, will play an important role in the world energy picture. More than 130 nuclear power reactors are already in operation and many more are under construction or planned. By the year 2000, more than one-half of the world's electric power is expected to be produced by nuclear power.

Nuclear reactors are sound exportable products. No technology has ever been developed in the U.S. with more step-by-step

safety assessment and strict regulation. Such regulation should be extended for any reactors exported to other nations. Cooperation and control are the crucial features of multinational nuclear power development. Effective safeguards are mandatory if nuclear power programs are to be pursued with maximum effectiveness in an atmosphere of mutual trust and confidence where nations can feel assured that other nations refrain from engaging in nuclear developments that could threaten their security.

A review of the record of international cooperation in nuclear power over the last 20 years reveals that significant benefits have resulted from the many agreements for cooperation which the U.S. has had with other nations. An extraordinary transfer of nuclear technology has taken place in this period, and we have no misgivings about this. Nuclear energy has too many peaceful benefits for any nation to restrict its use on grounds of secrecy or chauvinism, and we are indeed fortunate that this technology is available for extensive development in a period of dwindling fossil fuel resources.

ANNEX C

Title 10 CFR §110.7

Definition of Bloc Countries or Areas

Albania

Bulgaria

China, including Manchuria (and excluding Taiwan (Formosa)) (includes Inner Mongolia; the provinces of Tsinghai and Sikang; Sinkiang; Tibet; the former Kwantung Leased Territory, the present Port Arthur Naval Base Area and Liaoning province)

Communist-controlled area of Viet Nam

Cuba

Czechoslovakia

East Germany (Soviet zone of Germany and the Soviet Sector of Berlin)

Estonia

Hungary

Latvia

Lithuania

North Korea

Outer Mongolia

Poland

Rumania

Union of Soviet Socialist Republic

MATERIAL BALANCE, INVENTORY, AND RECORDS REQUIREMENTS

MUF, which is called inventory discrepancy, is defined in 10CFR § 70.51(a)(6) as

> "Material balance" means a determination of material unaccounted for (MUF) by subtracting ending inventory (EI) plus removals (R) from beginning inventory (BI) plus additions to inventory (A). Mathematically,
>
> $$MUF = BI + A - EI - R"$$

The uncertainty in the accountability system can be inferred by a statistical quantity called limit of error in MUF (LEMUF), which is defined in 10CFR § 70.51(a)(5) as

> "Limit of error" means the uncertainty component used in constructing a 95 percent confidence interval associated with a quantity after any recognized bias has been eliminated or its effect accounted for."

The allowable uncertainty in accountability is the LEMUF limit, the magnitude of which is given in 10 CFR § 70.51(e)(5) as

> "Establish and maintain a system of control and accountability such that the limits of error for any material unaccounted for (MUF) ascertained as a result of the material balances made pursuant to paragraph (e)(3) of this section do not exceed (i) 200 grams of plutonium or uranium 233, 300 grams of high enriched uranium or uranium 235 contained in high enriched uranium, or 9000 grams of uranium 235 contained in low enriched uranium, (ii) those limits specified in the following table, or (iii) other limits authorized by the Commission pursuant to paragraph (e)(6) of this section:

Material Type	Limit of Error of MUF on Any Total Plant Inprocess Material Balance* Percent
Plutonium element or uranium 233 in a chemical reprocessing plant	1.0

(con't.)

*As a percentage of additions to or removals from material in process, whichever is greater.

Uranium element and fissile isotope in a reprocessing plant	0.7
Plutonium element, uranium 233, or high enriched uranium element and fissile isotope--all other	0.5
Low enriched uranium element and fissile isotope--all other	0.5"

Exceptions to this are possible by provisions of 10CFR § 70.51(e)(6).

Explanations to NRC are required by 10CFR § 70.53(b) for excessive inventory discrepancy (MUF) and for inadequate uncertainty in accountability (LEMUF). The requirement in 10CFR § 70.53(b)(1) for MUF is

> "If the material unaccounted for exceeded both (i) its associated limit of error, and (ii) 200 grams of plutonium or U-233, 300 grams of high enriched uranium or uranium U-235 contained in high enriched uranium, or 9000 grams of U-235 contained in low enriched uranium, a statement of the probable reasons for the material unaccounted for and actions taken or planned with respect to the material unaccounted for."

The requirement in 10CFR § 70.53(b)(2) for LEMUF is

> "If for any material the limit of error of the material unaccounted for balance exceeds any applicable limits specified in § 70.51(e)(5) or approved pursuant to § 70.51(e)(6), a statement of the probable reasons for the limit of error and actions taken or planned with respect to the limit of error."

ANNEX E

TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS (NPT)

States Party to the Treaty

United States
USSR
United Kingdom
Afghanistan
Australia
Austria
Boliva
Botswana
Bulgaria
Burundi
Cambodia
Cameroon
Canada
Central Africa Republic
Chad
China (Republic of)
Costa Rica
Cyprus
Czechoslovakia
Dahomey
Denmark
Dominican Republic
Ecuador
El Salvador
Ethiopia
Fiji
Finland
Gabon
German Democratic Republic
Ghana
Greece
Guatemala
Haiti
Holy See
Honduras
Hungary
Iceland
Iran
Iraq
Ireland
Ivory Coast
Jamaica
Jordan
Kenya
Laos
Lebanon
Lesotho
Liberia
Malagasy Republic
Malaysia
Maldive Islands
Mali
Malta
Mauritius
Mexico
Mongolia
Morocco
Nepal
New Zealand
Nicaragua
Nigeria
Norway
Paraguay
Peru
Phillippines
Poland
Romania
Rwanda
San Marino
Senegal
Sierra Leone
Somalia
Sudan
Swaziland
Sweden
Syrian Arab Republic
Thailand
Togo
Tonga
Tunisia
Upper Volta
Uruguay
Vietnam (Republic of)
Yugoslavia
Zaire

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,

Plaintiff,

-v-

NUCLEAR REGULATORY COMMISSION, et al.,

Defendants.

AFFIDAVIT

75 Civ. 2121 (WCC)

DISTRICT OF COLUMBIA)
WASHINGTON, D. C.) SS.:

I, Maj. Gen. Ernest Graves, Jr., being duly sworn, do depose and say:

1. I am the Director of the Division of Military Application of the U. S. Energy Research and Development Administration (ERDA) and have been so employed since the creation of this Agency in January 1975. Formerly, I was employed in a similar capacity with the Atomic Energy Commission.

2. I was graduated from the U. S. Military Academy at West Point in 1944 and was later granted a Ph. D. in physics by the Massachusetts Institute of Technology. I was assigned to the nuclear weapons assembly and testing activities at Sandia Base, Los Alamos, and the Enewetak Proving Ground in 1947 and 1948, and was later in charge of training of the operating crew for the Army's nuclear power plant at Ft. Belvoir, Virginia. I participated in research on nuclear excavation of an Isthmian sea level canal at the Lawrence Livermore Laboratory from 1959 through 1964. I was assigned to my present position in December of 1973. This position involves management of nuclear weapons research and development at Los Alamos, Livermore and Sandia Laboratories, the testing of nuclear weapons at the Nevada Test Site, and the production of nuclear weapons by ERDA contractors.

3. I have read the affidavit of Peter N. Skinner of May 2, 1975, filed with the Court in the above-captioned case, which statement proposes a step by step description of how to make a nuclear bomb using plutonium.

4. The affidavit is not a scientific, nor an accurate explanation of how to make a nuclear bomb. It appears as a colloquial and very abbreviated outline of some basic concepts which, however, would not be sufficient

EG

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either in their accuracy or their completeness, to insure success. Not only does the affidavit fail to demonstrate a depth of knowledge sufficient for such an effort, but also ignores certain pitfalls and serious hazards inherent in the process.

5. It would not be appropriate here to explain in any detail the construction of a nuclear bomb. However, it is worthwhile to show, by a couple of examples, certain deficiencies in affidavit's step by step description:

a. In paragraph 5, Mr. Skinner employs the use of a Geiger counter to detect neutrons escaping as the assembly approaches criticality. The Geiger counter does not, however, detect neutrons effectively and could result in a fatal exposure to radiation. The glove box proposed by Mr. Skinner would provide no protection against such neutron radiation. Mr. Skinner's entire discussion of the use of a Geiger counter appears confused, even if a suitable neutron detector were employed, because as criticality is approached, more neutrons escape rather than fewer, as Mr. Skinner would have it.

b. Approximately ten kilograms of plutonium without any reflective device is commonly considered to constitute a critical mass. Once such a reflector is introduced, a lesser amount can become critical. Therefore, the quantities designated by Mr. Skinner, especially in the absence of correct measurement techniques, could result in a critical assembly and, consequently, fatal exposure. By criticality here I do not mean a nuclear explosion, but merely a flood of radiation as a result of a self-sustaining chain reaction which naturally occurs when either the mass of plutonium exceeds approximately 10 kilograms or when a reflector allows a smaller quantity of the material to sustain a chain reaction. Much more than criticality is needed for a nuclear explosion, however. To have such an explosion, "super-criticality" or

a run-away chain reaction must occur. It is the latter event in a controlled environment that makes a bomb. However, the details of such an environment and of the devices needed to create it are not found in Mr. Skinner's statement.

Ernest Graves, Jr.

Maj. Gen. Ernest Graves, Jr.

State of Md., Mont. County
Subscribed and sworn before
me this 29th day of May, 1975.

Notary Public

My Commission expires. 7-1-78

CERTIFICATE OF SERVICE

I hereby certify that the attached JOINT APPENDIX was personally served upon the attorneys for defendants in this action this 16th day of April, 1976

JOSEPH J. ZEDROSSER
Assistant Attorney General